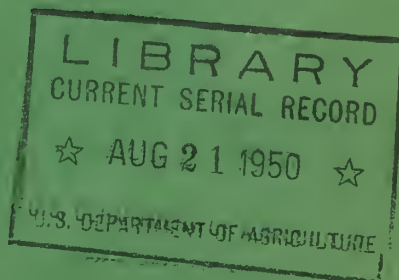


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ABSTRACTS *of* RECENT PUBLISHED MATERIAL on *Soil and Water Conservation*



UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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ABSTRACTS OF RECENT PUBLISHED MATERIAL
ON SOIL AND WATER CONSERVATION

By: J. H. Stallings, Soil Conservationist,
Soil Conservation Service

FOREWORD

The purpose of this publication is to bring together a summary of current information about soil and water conservation for ready reference of those who are actively engaged in soil conservation work. Its distribution will be confined to technical personnel of the Soil Conservation Service and cooperating agencies and to such other scientists or conservation workers as specifically request it. It supersedes the publications, entitled "Research Summaries" that has been issued previously by the Service in seven parts.

This publication will be issued at irregular intervals as new material seems to warrant it, probably about twice each year. Each issue will include three sections, (1) subject matter index, (2) abstracts of publications, and (3) author index.

The active cooperation of all Service Personnel and cooperating personnel, who publish any significant material, is needed if this publication is to adequately serve the intended purpose. Such cooperation can best be rendered by supplying this office with an abstract, reprint, or copy of the published item as soon as it is published.

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REPORT TO COOPERATORS ON WATER SPREADING INVESTIGATIONS IN SAN JOAQUIN VALLEY, CALIFORNIA.

By Dean C. Muckel; USDA, SCS, Logan, Utah. Mimeo. April 20, 1949.

Studies were started in 1944 at the Wasco and Minter field test ponds in the San Joaquin Valley to determine why the rate of percolation decreased below the economical limit of percolation rate after a few week's run when water was applied continually to undisturbed soil, and to discover, if possible, practical ways of overcoming or at least retarding the decrease. It was found that the percolation rate decline is caused primarily by conditions within the top foot or less of soil.

The most significant conclusion that can be drawn at this time is that the percolation rates obtained for soils under natural conditions and not underlain by restricting hardpan or other strata can be increased materially by surface treatment of the soil. The most beneficial treatment so far has been the addition of cotton gin trash, either disked under or allowed to float on the water surface. The effect is not immediate, but requires an "incubation" period during which the gin trash or waste starts decomposition. Usually, the highest percolation rates are obtained after a dry period follows an incubation period. Peak rates of 14 feet per day, which is three to four times the rates obtained with undisturbed soils have been obtained consistently on treated soils.

It is not known how long the application will be beneficial. One treated pond still shows highly beneficial results 3 1/2 years after application of gin trash. Other treatments tried show results of various degrees, some negative.

The reason for the increase in percolation rates under the gin trash application is not known. Neither is the quantity of gin trash required for most beneficial results known. So far, the applications have been made in rather copious amounts.

Growth of vegetation has been the second-best treatment, and this may in the long run prove to be the most practical treatment. Several types of vegetation were tried not only to disclose their effect on percolation rates, but also to determine what types would survive under conditions associated with spreading. In selecting types of vegetation for trial, one prerequisite was that the vegetation should have value as a grazing or forage crop, so as to provide some cash income from the lands. Bermuda grass has proved to be helpful to percolation, if well established. It grows under spreading conditions if the water on the land is held at a shallow depth and does not submerge the grass tops. It is also a good pasture crop. Its effect on percolation is, however, not nearly so beneficial

as the cotton gin trash.

All treatments tried have been placed under one of five different classes. The five classes are: (1) chemical, (2) mechanical, (3) operational procedures, (4) addition of organic matter, and (5) vegetative trials.

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SOUTHWESTERN TREES AND SHRUBS.

By B. W. Allred; Sheep and Goat Raiser, San Angelo, Texas, Vol. 29, No. 10, p. 24. July 1949.

Ocotillo produces from one to numerous slender spiny branches near the base which taper upward and outward and grow from 3 to 18 feet high. It has negligible grazing value and is not outstanding for soil conservation purposes.

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OUR LAND RESOURCES - WE CAN USE THEM AND KEEP THEM.

By Roy D. Hockensmith; USDA, Misc. Pub. 663. January 19, 1949.

The author discusses the importance of maintaining land resources in order to support future populations. An adequate amount of productive land - properly used and so protected that it will remain permanently productive - is an important element in maintaining a prosperous agriculture and the economic stability of any nation.

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PRINCIPLES OF THE LAND-CAPABILITY CLASSIFICATION.

By R. D. Hockensmith and J. G. Steele; USDA, SCS, Washington 25, D. C. Mimeo. July 1, 1949.

The authors explain how land may be classified according to its capabilities for farming and other uses. The collection of certain factual information relative to the land is essential. This information is collected in the field and usually recorded in map form. With the finished map as a basis the land is then classified according to its capability into 8 classes. Each of these 8 classes is described and a brief explanation given as to how it can be used safely and the practices needed on each kind of land to maintain and improve it under common safe uses are listed.

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FORTIFIED OIL EMULSION SPRAYS FOR CONTROL OF WEEDS ON DITCHBANKS IN THE EL PASO VALLEY.

By Olan E. Anderson and P. J. Lyerly; Texas Agr. Exp. Sta. Progress Report 1171. May 25, 1949.

Fortified oil emulsions have shown considerable promise for control of weeds on irrigation ditches in preliminary tests in the El Paso Valley. Oils from 32+ to 27+ gravity have been found best in weed sprays. The less refined and cheaper grades of oils are more desirable for weed control because they are more toxic than refined oils. Fortified oils are superior to straight oils. Burner and low grade diesel oils, when fortified, should be diluted and made into emulsions.

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MORE LEGUMES AND GRASSES - PROBLEMS AND BENEFITS.

By E. L. Sauer; Illinois Farm Economics, Nos. 168 and 169, pp. 841-847. May-June, 1949.

The long-time benefits of increased acreages of legumes and grasses are shown by research studies in the economics of soil conservation. In these studies neighboring farms of similar soil resources are compared - that is, farms with similar land-use capabilities and of the same size but with differences in the amount of soil and water conservation practices applied.

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LET'S LOOK AT THE SOIL.

By M. F. Miller; Mo. Agr. Exp. Sta. Cir. 330. July 1948.

The soil supplies us with our food, most of our clothing and much of our shelter. But the soil provides food for other living things, too. The very small organisms, or microbes, including bacteria, which live in the soil, have first chance at it. They eat at the first table. The plants, which furnish food directly to man and animals, eat at the second table. At the third table are animals. Man obtains his food from both plants and animals.

Whether we eat bread, vegetables, fish, fowl, or beefsteak, each of these comes from plants, in one way or another, and from the fertility released by the soil.

Our clothing comes from cotton, flax and other plants which get their food from the soil. Nylon is made from coal which was formed from vegetation grown thousands of years ago. Rayon is made from wood and other plant products. Wool, furs and skins come from animals which get their food from the soil.

Our homes and buildings are wholly or partly made of wood and our papers and magazines are made from wood pulp, both products of the soil.

The soil is the foundation of life and of civilization. Those who live in towns and cities, as well as those on farms, have a big stake in it. Our soil must be kept productive or the foundation of life will crumble and our civilization will perish.

Farming poor, worn-out soil brings poor health, poverty and despair. On the other hand, farming fertile soil leads to prosperity, to better health, and to modern standards of living for the farm family. It also assures an ample supply of high quality food for those who live in towns and cities. Keeping the soil highly fertile and preventing it from washing away are necessary if we are to remain prosperous and our democracy strong. That's why all of us should have a keen interest in the soil.

The author takes his readers on a trip through the soil to get a bug's eye view and to learn something of how it is formed. He then takes them on a trip into the air by plane to get a bird's eye view to see the soil from the outside.

On these trips the readers learn what the soil is and something about its nature; how it is affected by the many soil organisms living in it; the various ways in which the soil loses fertility, the plant food necessary for crop growth, and the methods through which the soil may be improved and its fertility conserved.

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SUMMARY OF RESULTS - SOIL AND WATER CONSERVATION EXPERIMENTS, DIXON SPRINGS, ILLINOIS.

By C. A. Van Doren and L. E. Gard; Ill. Agr. Exp. Sta. and SCS, Urbana, Ill. Mimeo. May 1949.

This publication is a summary of the results obtained at the Dixon Springs Experiment Station.

Moderately grazed pastures produced an average annual acre yield of 3,448 pounds of desirable forage compared with 2,507 pounds for severely grazed pastures. The moderately grazed pastures produced 942 pounds of weeds per acre compared with 1,111 pounds for severely grazed pastures. Only 19 pounds of forage was needed to produce a pound of gain in weight of sheep on the moderately grazed pasture compared with 51 pounds for each pound of gain for the severely grazed pastures. Fertilized pastures produced 484 pounds of sheep gain per acre compared with a gain of 185 pounds for unfertilized pastures.

Other studies reported include (1) length and per cent of slope and (2) mulch and tillage studies.

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THE EFFECT OF CHEMICAL AND FLAME WEED KILLERS ON SOIL STRUCTURE.

By C. L. W. Swanson and H. G. M. Jacobson; Paper presented at the Northeastern Weed Control Conference, Hotel New Yorker, New York City, January 5-7, 1949, Published in the Proceedings, pp. 65-72. Also mimeographed by Conn. Agr. Exp. Sta. New Haven, Conn.

A preliminary report of one year's study on the effect of using synthetic weed killers and their indirect effect on soil structure versus killing weeds by the usual cultivation methods is reported. Corn and carrots were the crop used.

These preliminary studies suggest that a combination of 2,4-D plus cultivation for weed control will produce largest corn yields per acre. Weeds in carrots were satisfactorily controlled by oil spray but the preliminary results suggest that limited cultivation may increase yields.

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INFILTRATION IN RELATION TO RUNOFF ON SMALL WATERSHEDS.

By A. L. Sharp, H. N. Holtan and G. W. Musgrave, USDA, SCS-TP-81. June 1949.

Studies were organized and established on claypan soils near Edwardsville, Ill., and on the more youthful and permeable soils in the vicinity of Colorado Springs, for the purpose of learning more about the relation of the various segments of a watershed to its performance as a whole.

On these watersheds information was obtained as to variations in soil and vegetal cover, and infiltration curves were derived for the various segments through repeated operations of an infiltrometer, including the sampling at frequent intervals of all parts of the watershed. These studies show significant relationships between infiltration, vegetal cover, and soil depths. At Edwardsville they also showed significant relationships with antecedent soil moisture, while at Colorado Springs they showed significant relationships with soil and water temperature.

The type F infiltrometer which was used to sample the various segments of the watershed provided the basis for hydrographs of the different segments of the area and their deviation with season. On the basis of this and other information, isopotential areas, or areas having similar infiltration characteristics, were delineated.

On each of the isopotential areas semipermanent plots were installed so that rates of runoff on an exaggerated scale were obtained for the same natural storms that produced runoff from the entire watershed.

The basis was thus laid for various trials of computing runoffs and comparing them with actual runoff from the entire watershed.

On the claypan watersheds at Edwardsville it was found that the infiltration varied with soil moisture content, depth of soil, and to some extent with the nature of the vegetal cover. The infiltration varied seasonally with the maximum occurring in midsummer. For a number of large storms the computed hydrograph agreed very closely with the observed hydrograph.

For storms of low intensity, however, greater difficulty was found in achieving agreement, due probably to wider variations in canopy interception, surface detention, and infiltration in the freshly saturated soil zone.

On the more permeable soil at Colorado Springs, the conditions called for a somewhat different approach to the calculation of a synthetic hydrograph. On this watershed there were no incised drainageways but there was a grassy swale leading to the weir, composed of highly permeable material in which the infiltration rate was very high. For small storms the yield of water from the margins of the basin would often be entirely infiltrated in the grassy swale. For large storms, however, where the infiltration was a small proportion of total water from the watershed, there were much more direct relations between the hydrographs of small plots within the watershed and the hydrograph of the complete watershed.

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EXPERIMENTS IN SOIL EROSION AND INFILTRATION ON RANGE LANDS IN THE HIGH PLAINS.

By W. D. Ellison; USDA-SCS, Fort Worth, Texas. Mimeo. 1948.

This paper is a report on studies conducted at Amarillo, Texas. The studies were begun about February 16, 1948, and continued over a period of about two months. The purpose of the project was (1) to evaluate detachability characteristics and infiltration capacities of soils and (2) to determine the protective values of different range covers.

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WHAT PRICE WEEDS?

By Robert B. Balcom; The Reclamation Era, Vol. 35, No. 8, pp. 171-172 and 176. August 1949.

It is estimated that weeds cost the irrigation farmers of the west about \$25,000,000 annually in stolen water. This loss is exclusive of the loss caused by the weeds growing with the crop plants.

Weeds in general have a higher water requirement than cultivated plants. A heavy crop of lambsquarters used about 40 per cent more water than alfalfa, one of the heaviest water users among crop plants. A thick stand of smartweed - a Polygonum - found not only in fields, but particularly abundant along irrigation ditches, may consume in a season's growth on 1 acre enough water for the year's irrigation of 3 acres of alfalfa. Emergent aquatic species like tules, cattails and reeds used 9.63 acre-feet of water for each acre of these weed pests. Tules and cattails may use 15 or more acre-feet of water in a single year, particularly when the plants grow in narrow strips as often happens along irrigation ditches.

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LININGS FOR IRRIGATION CANALS.

By O. W. Israelsen and C. W. Lauritzen; The Reclamation Era, Vol. 35, No. 8, pp. 167-168 and 176. August 1949.

The proper use of canal linings decreases water losses, facilitates water deliveries, saves labor, contributes to weed control, prevents soil erosion, retards soil waterlogging and adds beauty to irrigated regions. The authors discuss the various types of materials being used for canal linings.

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THE STORY OF A LAKE.

By E. D. Walker; Ill. Ext. Ser. Cir. 644, Urbana, Ill. June 1949.

A great many people are involved in this story of a small lake in Central Illinois. It concerns first the city people who built the lake and live near it, and the farmers whose lands drain down into the lake. But it really is of vital importance to all the people of this country - everyone, without exception.

The lessons in this story are crystal clear. Either we as a nation must find a way to hold our fertile soil where it is, or some day we shall be hungry as older nations of this world are now hungry.

Many of our farmers won't have to wait until they are through with their land to see that it has literally washed out from under their plows. It is being washed away now - how fast is indicated by the story of this lake. We may be enjoying prosperity because of improved varieties of crops - hybrid corn, for example - but this prosperity cannot last unless the soil lasts.

This story, we trust, will convince more farmers to take the steps needed to save their soils, and will stir others to take an interest in the

national problem of conserving our soils - our greatest natural resource, and one we cannot replace.

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THIS IS OUR SOIL.

By Ernest D. Walker and Albert B. Foster; Issued by Vernon L. Nickell, Superintendent of Public Instruction, Springfield, Illinois. April 1949.

This is a booklet prepared for use in the public schools of the State of Illinois. It was prepared for the purpose of conveying an understanding of the soil which gives us plant and animal life. If it were not for good soil, it would not be possible for us to keep healthy and to enjoy life.

Worn out soils have lost their plant food and are unable to produce as high yields per acre as they once did. Man has taken his food from the soil over a long period of years and has put little back into it. For that reason it is important that we learn how to take care of the soil that is left in order that we and those who follow us may have a good living.

There are several different ways by which we can take care of our soil. One means of doing this is the use of fertilizer or lime; a second means is that of improved farming methods such as contour farming, strip cropping, the use of grass waterways, reforestation and others. It is hoped that this booklet may give you further ideas on what is meant by such words and that the pictures will enable you to fix clearly in mind an understanding of some of the means by which the soil can be saved.

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THE EFFECT OF EARTHWORMS ON THE PRODUCTIVITY OF AGRICULTURAL SOIL.

By Henry Hopp and Clarence S. Slater; Jour. Agr. Research, Vol. 78, No. 10, pp. 325-339. May 15, 1949.

Tests were made to determine the effect of earthworms on the productivity of soil. In five tests with different crops and soils, earthworms consistently increased yields. Their influences varied widely according to crop and soil. The increases in yield were attributable to the release of beneficial chemicals from the bodies of the earthworms and their physical effects on soil structure.

The beneficial chemicals were not identified, but their effects were not offset by liberal application of N-P-K and fresh cow manure. Available evidence suggests that the release of beneficial chemicals occurs principally in the summer season when earthworms normally pass through

their reproductive period. Beneficial physical effects on soil structure were obtained on soils where the lack of structure was limiting to the crop growth.

THE ACTION OF FROST ON THE WATER-STABILITY OF SOILS.

By Clarence S. Slater and Henry Hopp; Jour. Agr. Research, Vol. 78, No. 10, pp. 341-346. May 15, 1949.

Freezing and thawing decreased the water-stability of moist soils. The detrimental effect of freezing and thawing was most marked at high moisture contents. The loss of water-stability was increased by repeated freezing and thawing. Rate of freezing and thawing had no effect on the loss of water-stability.

Methods designed to overcome the harmful effects of frost action should be based on reducing the depth and frequency of freezing, and on maintaining drainage channels in the soil layer where freezing takes place in order to keep the moisture content as low as possible.

A PRINCIPLE FOR MAINTAINING STRUCTURE IN CLEAN-CULTIVATED SOILS.

By Henry Hopp and Clarence S. Slater; Jour. Agr. Research, Vol. 78, No. 10, pp. 347-352. May 15, 1949.

This study was undertaken to determine whether the structure of clean-cultivated soil would be maintained by protecting the ground over winter, thereby decreasing depth and frequency of freezing, and stimulating the activity of the earthworms in making holes to remove excess water during critical freezing periods.

The effect of winter protection on the structure and earthworm population of soils was determined in plots at College Park, Maryland; Wooster, Ohio; and Holgate, Ohio. The soil-structure measurements used were infiltration rate, water-stability, and volume of large pores.

Clean-cultivated land left bare over winter had poorer soil structure and a lower earthworm population than land protected by sod. The soil structure and earthworm population were much improved in clean-cultivated land by protecting the ground surface over winter with an insulative cover. Winter cover had only slight effect on the structure of soil in sod. Hay mulch was more effective than asphalt roofing paper in maintaining the structure of clean-cultivated soil over winter. Where mulching is impractical, other methods of applying the principle of winter protection to clean-cultivated land

will have to be devised.

A HALF CENTURY OF CROP ROTATION EXPERIMENTS.

By R. S. Bell, T. E. Odland and A. L. Owens; R. I. Agr. Exp. Sta. Bul. 303, Kingston, R. I. January 1949.

Fifty-three years of crop rotation studies, started in 1894, were concluded in the fall of 1946. These experiments were on Bridgehampton very fine sandy loam soil that was originally acid and produced meager crops. Within a very few years it became evident that the yields of crops could be materially increased by the use of agricultural lime and chemical fertilizers. The records of the last 17 years of the experiments are reported in this bulletin and comparisons are made with results from former years.

The 3 rotations described in this bulletin are known as rotations B, E, and F. B was a 6-year sequence: 1 year of potatoes followed by a year of ensilage corn and 4 years of alfalfa-timothy hay. Rotations E and F were 5-year sequences in which potatoes were followed by Rhode Island White Flint corn and 3 years of hay. Rotation E contained alfalfa, red clover and alsike clover as well as timothy and redbot in the grass seed mixture. The meadow seeding for rotation F consisted of timothy and redbot grasses.

The average yields of Irish Cobbler potatoes were: 222 bushels per acre on the "clover rotation" and 294 bushels per acre on the "timothy-redbot" rotation. The superior yields of potatoes after the non-legume hay is thought to result, in part, from a more favorable supply and balance of potassium, calcium and magnesium left by the grass crop.

Rhode Island White Flint Corn yielded slightly more grain when grown after the legume-grass hay rather than grass hay alone. The supply of available nitrogen seemed to be a controlling factor influencing the yield of corn.

The alfalfa-timothy seeding outyielded the general legume hay mixture during the second and third years. The non-legume seeding produced the smallest amount of hay with the least feed value. The general legume mixture usually produced more hay the first year because the biennial clovers that it contained appeared to mature more quickly than the alfalfa.

The average net returns per acre were figured for 2 periods of 5 years, 1935-1939 and 1942-1946. During the first period these net returns per acre were \$40.77, \$24.46, and \$10.93 for rotations B, E, and F, respectively. During the second period the net returns were \$61.44, \$34.52, and \$39.85, respectively for these rotations.

IRRIGATION MAKES WEEDS GROW TOO!

By F. L. Timmons; What's New in Crops and Soils, Vol. 1, No. 8, pp. 14-17, June-July 1949.

Irrigation, in addition to making the arid lands "blossom as the rose" with luxuriant vegetation, encourages a vigorous growth of non-economic plants. Indeed, the water often carries the seeds or other propagation parts of these weeds with it, as it flows from the rivers and reservoirs throughout the canals and out onto the land. These unwanted guests include most types of vegetation that grow where water is abundant. They fall into three general groups, i.e., (1) aquatic weeds, (2) ditchbank weeds, and (3) farmland weeds.

Brief references are made to recent progress made in controlling weeds in irrigated areas by means of chemicals.

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THE CONIFEROUS WINDBREAK SPACING TEST AT THE BIG SPRING STATION.

By F. E. Keating; Texas Agr. Exp. Sta. Progress Report 1177, Multilithed. July 26, 1949.

The coniferous spacing test was started in 1932. Arizona cypress, Austrian pine, Oriental arbovitae, Ponderosa pine, Redcedar and Rocky Mountain juniper are being used.

It seems that a very effective farm or ranch windbreak could be secured by using two or three rows of conifers, preferably the Arizona cypress and the redcedar. In a three-row planting, the border rows could be redcedar, and the center row the Arizona cypress. With an average annual rainfall of only 18.89 inches, it would be relatively safe to use a spacing of about 12 feet between trees in the rows, with the rows 12 feet apart.

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A STUDY OF SMALL UPLAND RESERVOIRS IN THE MERAMEC RIVER BASIN - PART II.

By Missouri Division of Resources and Development; Jefferson City, Mo. June 28, 1949.

This is an evaluation of the benefits which could be expected to accrue to the small upland reservoir system in the Meramec River Basin from its contribution to recreation and fish and wildlife. A discussion of the costs and benefits is also included.

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RANGE RESEEDING BY AIRPLANE COMPARED WITH STANDARD GROUND METHODS.

By George Stewart; Agron. Jour., Vol. 41, No. 7, pp. 283-288. July 1949.

The author describes the ground methods of re-seeding which have so far been successful on range lands and the relative success of comparable airplane seeding from the experimental data and experience available.

On most range lands, reseeding by standard on-the-ground procedures has so far given more dependable results than has airplane seeding, both in getting a stand and in obtaining good yields of forage. The yields from airplane seeding on sagebrush ranges have been from 50 to 150 pounds of air-dry forage per acre. On similar areas, the yields obtained by recommended ground procedures have been from 300 to 3,000 pounds of air-dry herbage, or 5 to 50 times as much as from airplane seeding.

To insure successful growth of reseeded species in the arid western United States, all seeds need to be covered to a shallow, uniform depth. Where the seedbed is such that covering can be provided by natural means as in loose soil, deep ashes, or fallen leaves, the airplane is a promising means of seeding that deserves further investigation. Rapidity of seed distribution and coverage of rough or obstructed terrain are the greatest assets of the airplane.

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DESIGNING AGRONOMIC PRACTICES TO MEET SPECIFIC EROSION HAZARDS.

By G. W. Musgrave; USDA, SCS-TP-84. July 1949, and Jour. of Soil and Water Conservation, Vol. 4, No. 3, pp. 99-102. July 1949.

The design of an agronomic program to meet erosion hazards may differ in vital respects from an agronomic program designed to secure crop production. It is obvious that preservation of the physical well-being of the soil results in improved production. However, the primary objectives in a program of soil and water conservation deal with the preservation of the physical properties of the land, and toward this aim the agronomy program should be directed. To do this with the greatest efficiency requires a careful analysis of the dominant factors of cause and effect. The objective must be clearly defined.

This paper outlines a method of procedure for defining the objective as well as a method for accomplishing this objective with reference to soil erosion resulting from rainfall.

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WHAT'S IN THAT SOIL MAP?

By F. D. Hale and R. J. Muckenhirn; What's New

in Crops and Soils, Vol. 1, No. 9, pp. 7-9. August-September, 1949.

Soil maps are valuable inventories. Together with soil reports, they provide a sound basis for using land more intelligently. Soil maps are being used in connection with land appraisal, rural zoning, farm loans, crop quotas, agricultural experiments, individual farm planning, forest planting, and other rural developments.

Soil maps and reports go together. The maps show the location and extent of the various kinds of soils. The reports give a description of each soil, its capacity to produce cultivated crops, hay, pasture, or forest, and its response to a variety of management practices.

Recent soil maps indicate the nature of the surface soil, subsoil, and parent material; wetness or droughtiness of a soil; the degree of erosion at the time of survey; the slope of the land; the general native productivity of a soil.

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TAILOR-MADE HURRICANES WHIP UP EROSION FACTS.

By Elbert B. Macy; What's New in Crops and Soils, Vol. 1, No. 9, pp. 12-13. August-September 1949.

The author outlines briefly a study being conducted on wind erosion at Manhattan, Kansas. The project seeks (1) to determine the basic causes of soil erosion by wind in the High Plains area and (2) to study relations between the rate of wind erosion and the principal factors affecting it.

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SAND LOVEGRASS - PRODUCER OF BEEF.

By Albert L. Brown and E. H. McIlvain; What's New in Crops and Soils, Vol. 1, No. 9, pp. 14-15. August-September, 1949.

Native sand lovegrass is one of the more palatable and nutritious grasses being used in re-seeding unproductive and abandoned farm land in the Southern Great Plains. This lush-growing, fine-stemmed, medium-tall bunchgrass, with its dense growth of soft basal leaves, produces a high yield of excellent forage. A prolific seeder, it produces a large quantity of easily harvested seed, which makes it a valuable plant for commercial seed production. This also enables it to fill out thin stands voluntarily.

A reseeded pasture of sand lovegrass has consistently proved superior to every other grass or grass mixture and to native range. The sand lovegrass pasture has produced an average of 422 pounds of live-weight gain per steer and 108 pounds per acre. This is an advantage of 30 pounds per head and 73 pounds per acre over

native range. The sand lovegrass also carried 108 more head per section.

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NEW WEAPON AIDS STOCKMEN IN THEIR WAR ON MESQUITE IN SOUTHWEST.

By Roscoe Fleming; What's New in Crops and Soil, Vol. 1, No. 9, p. 25. August-September 1949.

A new tractor-mounted "tree puller", which can back up to any tree less than 11 inches in diameter and snatch it out like a rotten tooth, is described.

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STUDIES IN GULLY CONTROL.

By George W. Hood; Ark. Agr. Exp. Sta. Bul. 486. May 1948.

Gully control was established on a 32-acre area. This land had been abandoned for agricultural purposes. In 1938, when the work began, there were 29 active gullies which made up 5 separate gully systems. Different practices were used on different gullies in order to compare their effectiveness. All of the practices used were ones which a farmer could easily put into effect on his own land without cash expense.

A diversion terrace was constructed above one of the principal gully systems to carry off the water which had been flowing into the gullies. The individual gullies in this system then received different treatments. All of the practices used were more effective in this area, from which the water had been diverted, than in the other gully system areas.

When the area was resurveyed after six years, it was found that all of the treated gullies were stabilized. The individual gullies which had been left untreated, as checks, were still active. Vegetative methods, where adapted, were found very effective in controlling gullies. Dams are temporary in nature. They proved useful in holding the area until vegetative measures became effective. Loose rock dams proved quite desirable because of the availability of the material in the region.

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PASTURE IMPROVEMENT FOR ARKANSAS UPLANDS.

By M. A. Sprague, R. P. Bartholomew and Warren Gifford; Ark. Agr. Exp. Sta. Bul. 485. May 1949.

The results of the pasture grazing tests reported give some indication as to the returns that may be obtained from using elementary pasture improvement practices on the thin and hill soils of the Ozark uplands.

The trials were conducted on 155 acres of rolling and stony to gravely silt loam soil which had been in crop production for many years and was then abandoned and allowed to remain in free range. The area was divided into 5-acre plots which were as uniform in topography and fertility as possible.

The preparation of the land for pastures included clearing it of brush and larger stones, plowing in the sides of gullies, harrowing with a spring-tooth harrow, and establishing pasture plants.

Most of the Bermuda grass pastures were established by dropping chunks of Bermuda grass sod in furrowed rows, three feet apart. The areas were overseeded the following two years with a lespedeza mixture made up of two parts of common, one part Korean, and one part Kobe lespedeza. Sprouts and weeds were controlled by mowing all but one of the pastures.

Beef animals were used to measure the pasture production. The large number of animals required to keep the areas grazed during several pasture seasons made it necessary to use animals of various ages and sizes. Therefore, a method was presented to compare the grazing data obtained from animals of various sizes on a common weight basis, using units designated as "animal grazing units". An animal grazing unit is a 1,000-pound animal or equivalent, based on total digestible nutrients (T.D.N.) required for maintenance, pastured for one day.

Four systems of grazing were compared. They were continuous light, continuous heavy, continuous heavy with a summer supplementary pasture, and rotational heavy.

FARM BUSINESS SUMMARY OF 144 NORTHEASTERN ILLINOIS FARMS LOCATED ON SLOWLY PERMEABLE SOILS, 1948.

By N. R. Urquhart, E. L. Sauer and H. C. M. Case; USDA, Mimeo. AE-2634, Urbana, Ill. July 1949.

Records were obtained on the operations of 144 farms in Ford, Iroquois, LaSalle, Livingston, Vermilion, and Will Counties in 1948. Similar studies were made for this area in 1945, 1946, and 1947. The data cover the farm business as a whole and, except when otherwise indicated, include both the tenant's and the landlord's share of the business on tenant-operated farms.

On 85 farms complete records were obtained by the survey method, while farm management records were used for 47 farms. In addition, Farmers' Home Administration records were used for 12 tenant-purchase farms in the area.

DEPTHS OF OVERLAND FLOW.

By D. A. Parsons; USDA, SCS-TP-82. July 1949.

A discussion of uniform laminar flow is followed by a description and analysis of flow measurements made under several conditions of bed roughness and disturbances by raindrop impact and vegetative cover. A simple modification of the laminar flow equation by inclusion of the ratio of actual to theoretical depth is suggested to adequately represent disturbed viscous flow. Values of the ratio are given for the several conditions that were tested. The conditions included a considerable range in vegetative cover on relatively smooth land surfaces.

CROP GROWTH AND SOIL REACTION.

By T. C. McIlvaine and G. G. Pohlman; W. Va. Agr. Exp. Sta. Bul. 337. May 1949.

The study was started (1) to study the effect of the reaction of a particular soil on the yields of various crops and (2) to compare the effect of aluminum sulfate and sulfuric acid, used to acidify soils, on the yields of crops. The field work was conducted on Wheeling fine sandy loam soil having an initial reaction of about pH 6.0.

The results presented here show a smooth growth curve relating pH to growth on a particular soil. Similar curves, with slightly different relationships, might be expected on other soils. The results, however, corroborate substantially the pH preferences of crops as shown by other investigators.

CONSTRUCTION OF FARM FISH PONDS.

By J. M. Lawrence; Ala. Agr. Exp. Sta. Cir. No. 95. June 1949.

The author discusses the size and type of drainage area for a pond; water supply; type of soil necessary to hold water; design of the dam, pond drain and spillway; and construction methods developed for building a pond. The discussion is based on studies conducted for the past 15 years during which time 137 ponds were constructed for use in fish production research.

SOUTHWESTERN TREES AND SHRUBS.

By B. W. Allred; Sheep and Goat Raiser, Vol. 29, No. 11, pp. 26-28. August 1949.

The author describes, outlines the distribution, and discusses the economic volume of the Pinyon Pine.

EFFECT OF SLOPE AND LENGTH OF RUN ON EROSION UNDER IRRIGATION.

By Stephen J. Mech; Agr. Eng., Vol. 30, No. 8, pp. 379-383 and 389. August 1949.

The author endeavors to outline the method and thinking followed in the study of erosion under irrigation. This was done in three steps. First, is the determination of the amount of silt a number of different rates of flow will pick up and carry under different crop and furrow conditions. Second, is the determination of the magnitude of flow rates occurring under the different crop and furrow conditions. Third, is the combining of the first two steps. This gives definite erosion values for the entire length of the furrows.

It was concluded that it is possible to have serious erosion on the upper end of irrigated fields when neither soil nor water are wasted at the lower end because the upper end of irrigation furrows carries a greater amount of water. Any practice that increases infiltration requires an increase in the irrigation head. Increasing the infiltration decreases the percentage of runoff but increases the potential erosion hazard along the furrow. Reditching and otherwise disturbing the soil in the furrow is one of the greatest factors that increases erosion. Even in such crops as alfalfa and wheat, reditching tears out the vegetation and leaves the unprotected soil in contact with the flowing water.

Reducing the grade by directing irrigation-furrows across the slope increases both the rate of infiltration and the necessary irrigation head. It reduces the amount of erosion only under irrigating conditions where there is an appreciable rate of runoff.

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DRAINAGE INVESTIGATIONS IN THE PLASTIC TILL SOILS OF NORTHEASTERN ILLINOIS.

By E. H. Kidder and W. F. Lyle; Agr. Eng., Vol. 30, No. 8, pp. 384-386 and 389. August 1949.

A study was made on the drainability of the plastic till soils of northeastern Illinois.

Perforated pipe wells were installed at intervals on a line perpendicular to a tile line. Daily measurements were made on the level of the water surface in these wells following periods of rainfall.

Field permeability studies emphasize the need of investigating the permeability of each soil horizon at or above the location of the tile since the least permeable horizon will limit the inflow to the tile system. It is believed that considerable variation may exist in the perme-

ability rates between fields in the same soil type. Satisfactory surface drainage channels have been constructed on minimum grades of 0.5 feet per 1,000 feet.

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WATER AND IRRIGATION NEEDS OF THE PACIFIC COAST.

By Irvin H. Althouse; Agr. Eng., Vol. 30, No. 8, pp. 387-389. August 1949.

The author discusses the need of water for irrigation and the water supplies for the Pacific Coast area.

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APPLICATION OF FLOOD-STORAGE ACCOUNTING METHODS.

By C. O. Clark; Trans., American Geo. Union, Vol. 30, No. 4, pp. 528-532. August 1949.

This paper discusses day-to-day application of the author's method of flood-storage accounting as used in flood-forecasting studies on the Roanoke River above Buggs Island Dam Site in Virginia. Use is made of data from six telemark installations at river gages above the dam site. This method has been used to predict successfully the flood rises on the Roanoke River.

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A MANOMETRIC SETTLING VELOCITY TUBE.

By Martin A. Mason; Trans., Amer. Geo. Union, Vol. 30, No. 4, pp. 533-538. August 1949.

A theory is developed for a manometric settling velocity tube which permits rapid, accurate determination of still-water settling velocities of sediments in the sand-size range. A preliminary design of apparatus is discussed.

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ARTIFICIAL RECHARGE OF GROUND WATER BY THE CITY OF BOUNTIFUL, UTAH.

By H. E. Thomas; Trans., Amer. Geo. Union, Vol. 30, No. 4, pp. 539-542. August 1949.

The city of Bountiful, Utah, is situated just beyond the eastern edge of an area where alluvial gravel and sand of Pleistocene and probably Tertiary age yield water by artesian flow. Attempts to recharge these aquifers by diversion of surplus stream water into a spreading canal east of the city have been unsuccessful, because of the relative impermeability of the torrential debris which has accumulated along the western base of the Wasatch Range. Instead, the water spread from the canal has increased the yield of permeable shore deposits of the Pleistocene Lake Bonneville which crop out east of the city.

COMPUTING SOIL TEMPERATURES.

By Walter B. Langbein; Trans. Amer. Geo. Union, Vol. 30, No. 4, pp. 543-547. August 1949.

This paper develops a method for computing temperatures at a point in a soil from surface temperatures. The method is adaptable to the irregular fluctuations in temperatures ordinarily found in nature as well as to ideal cases. The temperature at a point in the soil is expressed as a weighted function of antecedent temperatures at the surface. An analogy is made with the unit hydrograph, a familiar tool in hydrologic practice.

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SOME PROPERTIES OF WATER SOLUTIONS THAT INFLUENCE INFILTRATION.

By Joel E. Fletcher; Trans. Amer. Geo. Union, Vol. 30, No. 4, pp. 548-554. August 1949.

Poiseuille's approximation was modified to include the case where the solution in the capillary ends in an air-water interface instead of the usual large volume of water. Such factors as surface tension, viscosity, pore size, depth of wetting, head of water, wettability of the solid by the solution, and density of the solution appear in the resultant equation. Temperature is indirectly included in the equation since it enters into values of both surface tension and viscosity.

The relationships between infiltration rate and each of the various factors in the equation are as follows: Surface tension increases linearly with infiltration rate; viscosity decreases hyperbolically with infiltration rate; pore size increases infiltration rate parabolically; depth of wetting and head of water decreases infiltration rate hyperbolically; wettability increases infiltration rate in a skewed cosine curve; and temperature increases infiltration rate linearly. Brief experimental evidence was included to support the equation.

This paper points out the need for further research on the infiltration of solutions into dry soils and suggests directions that this research might take.

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PEDOLOGICAL RELATIONS OF INFILTRATION PHENOMENA.

By W. O. Smith; Trans. Amer. Geo. Union, Vol. 30, No. 4, pp. 555-562. August 1949.

An attempt is made to outline the principal features which should be considered in infiltration problems. The need for consideration of genetic and morphological relations is emphasized, especially the view that the latter is a boundary

condition for the quantitative procedures usually derived from the former. Detailed development of infiltration relations are given for the more usual genetic profiles. The role of soil structure in infiltration phenomena is developed in considerable detail. A discussion of fragmented soils is also given. A brief discussion of the physical mechanisms involved in infiltration develops the viewpoint that not only porosity and texture but also soil structure and moisture content are usually needed to define infiltration phenomena.

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THE RELATION OF GEOLOGY TO DRY-WEATHER STREAM FLOW IN OHIO.

By William P. Cross; Trans. Amer. Geo. Union, Vol. 30, No. 4, pp. 563-566. August 1949.

The regime of dry-weather flow of several streams in Ohio is presented by flow-duration curves. For comparison, the index of ground-water flow for each basin is the discharge in cubic feet per second per square mile which is exceeded 90 per cent of the time. These indices are shown on a map of Ohio, and are discussed with respect to known geological conditions. It is concluded that stream-flow records provide useful inferences to ground-water geology, but the converse is not true.

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FLOOD FREQUENCIES AND SEDIMENTATION FROM FOREST WATERSHEDS.

By Henry W. Anderson; Trans. Amer. Geo. Union, Vol. 30, No. 4, pp. 567-586. August 1949.

A multi-watershed, multi-storm, multi-variable approach was used to develop a hydrologic basis for evaluating flood control in Southern California. Flood peak discharge was shown to be related to six variables: Watershed area, two storm precipitation variables, a temperature index of snow, a watershed wetness variable, and forest cover density. Since peak discharges have been measured under widely varying forest cover conditions, the partial regression coefficient for forest cover density was used to convert measured discharges to estimated discharges for a single comparable cover condition (a 40-year-old cover). Then, the estimated discharges were used in frequency analyses. The relation of discharges to storm precipitation and the wetness variables provided a means of extending the short-time discharge record to a long-time record on the basis of a 69-year record of precipitation. The relation of sedimentation of reservoirs to maximum yearly peak discharge, area of main stream channel, and forest cover density was determined. Together with the discharge frequency this provided a means of determining sedimentation frequency and mean annual sedimentation.

From the determinations of the forest cover effectiveness, the effect of forest fires on peak discharges and sedimentation were evaluated for 41 watersheds.

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CROP RESIDUES CONSERVE SOIL AND WATER.

By J. H. Stallings; Jour. Soil and Water Conservation, Vol. 4, No. 3, pp. 103-106 and 127. July 1949.

The data presented here indicate that the most effective way to utilize crop residues and other vegetal covers is to keep them on the surface of the ground, rather than turn them under. The data also show that the proper use of these materials offers the most effective single measure of reducing erosion and runoff and bringing about other desirable conditions in cultivated soils leading to continued high production.

Crop residues and other vegetal covers are more effective in building up the organic matter content of the soil when left on the surface than when turned under. They are also more effective in improving the aggregate structure and infiltration capacity of the soil when left on the surface. Surface utilization of these materials lead to substantial increases in crop yields in many instances. Further investigation should reveal satisfactory methods of overcoming the depressing effects of mulch covers on crop yields, where they occur, and lead to even greater increases under those conditions producing superior yields now. They offer an opportunity for bridging the gaps existing in crop rotations where the covers from the rotation crops themselves do not furnish adequate protection from the destructive action of the falling raindrop.

The Chief function of crop residues and other vegetal covers in reducing erosion is energy absorption or protection from raindrop impact and not the impediment of overland flow. When left on the surface, vegetal covers de-energize the falling raindrop, thereby eliminating the destructive action of raindrop splash. This in turn prevents the chain of damaging reactions which the splashing raindrop sets in motion. We do not have the final answer or answers to the correct use of crop residues, nor of other vegetal covers, in this capacity. We do have enough information, however, to indicate that these hold the key to the erosion control problem on cultivated land.

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AGRONOMIC PRACTICES IN RELATION TO WILDLIFE.

By Wallace L. Anderson; Jour. Soil and Water Conservation, Vol. 4, No. 3, pp. 107-116 and 128. July 1949.

Wildlife in America largely depends upon an increased understanding between land management biologists and agronomists. The author tells how the direct application of many agronomic practices contribute to the real value of wildlife and to a resultant better biological balance of farm and ranch lands. He relates how the land management biologists help to bring about an increase in desirable kinds of wildlife, a decrease in those that are harmful to useful plants and animals, and to maintain a reasonable balance between living things and land use practices.

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EFFICIENT USE OF FARM MANURE FOR EROSION CONTROL.

By George R. Free; Jour. Soil and Water Conservation, Vol. 4, No. 3, pp. 117-118 and 124. July 1949.

This study was conducted for the purpose of determining the effects of different rates and methods of applying manure on soil erosion and surface runoff. A 3-year rotation consisting of corn, canning peas, and clover was followed. On one set of plots manure was turned under in the spring at the rate of ten tons per acre for the 3-year rotation, and on the other set at the rate of 20 tons per acre. The same amounts of manure were used on a third and fourth set of plots, but there the manure was applied as a top dressing immediately after planting.

Doubling the amount of manure plowed under had only a slight effect on runoff but did decrease erosion by about one-third. Using the same quantities of manure as top dressings gave marked reductions of both runoff and erosion. In fact, the low-rate application as a top dressing was considerably more effective in reducing losses than the high-rate application plowed under. The greatest benefit from the top dressing came during the growing season.

There was an appreciable increase in organic matter in the surface soil under all treatments. The increase was least for the treatment which permitted the greatest loss of soil. The method of using a given quantity of manure has been more important on its effect on erosion than the amount used. Using the manure as a top dressing did not depress crop yields.

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CONSERVATION PRACTICES AS RELATED TO FARM TRACTOR AND IMPLEMENT DESIGN.

By G. E. Ryerson; Soc. of Automotive Engineers, Inc., 29 West 39th Street, New York 18, N. Y. August 1949.

Conservation farming and the adaptation of the needed conservation practices are now recognized as a necessary part of any successful farming

enterprise. The majority of farmers are adopting conservation farming as fast as control measures, which are both effective and practical for the area and individual farms are developed, technical assistance in the selection and application of needed control measures becomes available and as the farmer is able to make the necessary changes in his farming system.

The adoption of conservation farming always results in changes in farm operations. Any change in the farm operation which alters the job to be done must also change the traditional requirements for farm machinery. The degree to which the requirements for farm machinery are changed depends on the type and intensity of conservation practices which are necessary to control erosion losses.

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PROBLEMS CONNECTED WITH SUBSOIL PLACEMENT OF FERTILIZERS.

By N. J. Volk; Proc. of the Twenty-Third Annual meeting of the National Joint Committee on Fertilizer Application, Including Reports of Cooperators, pp. 78-86. 1947.

The author reviews briefly the available data on subsoiling and deep placement of lime and fertilizer. The results reviewed indicate that subsoil placement of fertilizer paid off best when the subsoil was well drained and well aerated. The placement of fertilizer in the subsoil depends to some extent on the kind of crop grown. The applying of fertilizer in narrow bands in the subsoil without mixing it with the soil may not be beneficial if the soil is heavy, but for light-textured soils the mixing was not necessary in order to obtain a response.

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A TENANT BUYS A FARM.

By H. O. Anderson; USDA, SCS and Wis. Agr. Exp. Sta., La Crosse, Wisconsin, Mimeo. 1949.

Productivity of the land, generally, is considered in the establishment of land values. Price differentials between good and poor land are too small, usually, to reflect adequately the differences in net returns from the crops produced. Hence, poor land is usually overpriced relative to the price of good land. The author discusses a specific example which illustrates these claims.

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FIFTH ANNUAL REPORT, LIGHT SOILS, CENTRAL WISCONSIN FARM ACCOUNT WORK - ADAMS AND WAUSHARA COUNTIES, 1948.

By H. O. Anderson; USDA, SCS and Wis. Agr. Exp.

Sta., La Crosse, Wisconsin, Mimeo. June 1949.

This is the fifth annual report of the studies started in 1943 aimed at comparing the production and income possibilities from different grades of sandy soils in Waushara and Adams County Soil Conservation Districts in order to provide information needed for the preparation of farm soil conservation plans in the Central Wisconsin sand area.

The rainfall was more than 10 inches below normal for the months of April through September. Because of the drought, the sand farms were at a greater disadvantage in 1948 than for any of the four preceding years.

The per acre yields of corn and small grain were more than 50 per cent greater on the sandy loam than on sand and hay yields were more than 40 per cent higher. The value of the crops was almost twice as high per acre on the sandy loam than on the sand farms. Net income in terms of operator's labor earnings for the sandy loam farms averaged \$2,641. In addition, other members of the family were credited with \$724 in wages, making a total of \$3,365 in net family income. The average net income on the sandy loam farms was 79 per cent greater than the averages for the sand farms.

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GROUND-WATER SITUATION OF THE UNITED STATES.

By Garald G. Parker; Soil Conservation, Vol. 15, No. 3, pp. 53-58. October 1949.

The author treats the subject of ground-water broadly and touches briefly upon the significant points. He concludes that there is no present danger of depleting the ground-water supplies of this Nation, except locally. And, even in local areas, much can be done to prevent disaster by intelligent use of the aquifers once their hydrologic characteristics are known. Over short periods of time ground-water reservoirs can be overdrawn without serious results. During times of unusually heavy precipitation above-average replenishment of the ground water will postpone the day of reckoning resulting from overdevelopment. But we would be shortsighted indeed if we failed to recognize that, to protect the heritage that rightfully belongs to the next generation, long-range solutions to these problems must be developed.

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AN INFILTRATION STUDY.

By Glenn K. Rule; Soil Conservation, Vol. 15, No. 3, pp. 58-59 and 65-66. October 1949.

Cotton gin waste leads all other materials thus far tried as a surface treatment to hasten the

taking up of water by the soil in a way that leads it on down into the underground reservoir. The cotton gin trash was either disked in or allowed to float until it sank. The beneficial effect is not immediate but requires an aging period during which the gin trash or waste decomposes in some degree. Usually the highest percolation rates are obtained after a drying-out period of the soil, following the initial period of aging. Peak rates as high as 14 feet per acre per day, or 3 to 4 times those obtained on undisturbed or untreated soils, have been reached. It is not known how long one application will be beneficial, but one treated basin still shows highly beneficial results 3 1/2 years after the application of gin trash.

Other treatments than application of gin waste show results of varying degrees - some negative - but because the gin trash is a waste product in the San Joaquin Valley and the results from its use are so promising, the work there has been concentrated on this treatment.

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SPREADING WATER FOR RECHARGE.

By A. T. Mitchelson; Soil Conservation, Vol. 15, No. 3, pp. 66-70. October 1949.

In the humid regions recharge of ground-water supplies generally occurs naturally and more regularly than in the drier and more arid regions. In the western or arid regions where there are cycles of deficient precipitation, replenishment is much slower, because during these dry periods it is necessary to supplement a scant surface-water supply by increased draft on ground water to irrigate crops and satisfy domestic and industrial demands.

There are two types of aquifers in the west which are susceptible of both artificial and natural recharge. Water-bearing formations differ greatly in their capacity to transmit water and in the quality they will yield from storage. These types are (1) those with low rates of recharge and where heavy withdrawals are mostly from storage; and (2) those with high rates of recharge, transmission, and discharge, which are therefore capable of furnishing large perennial supplies. The author discusses the second type of aquifers in this article.

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PREPARATION AND USE OF COMPOSTS, NIGHT SOIL, GREEN MANURES, AND UNUSUAL FERTILIZING MATERIALS IN JAPAN.

By C. L. W. Swanson; Agron. Jour., Vol. 41, No. 7, pp. 275-282. July 1949.

Farm manures, composts and night soil play an important role in Japanese agriculture. The com-

mon method for making composts is described. Information on the handling of night soil, both storage and application, is given. Survival periods and other information on various pathogenic organisms in stored and applied night soil is presented. Data on the composition of composts, night soil, and other kinds of manures are included as well as recommended applications of night soil and compost for the important food crops grown in Japan.

The effects of the atomic bombings on crop yields in Hiroshima and Nagasaki are briefly discussed.

Information on the use of several kinds of unusual fertilizers and soil amendments in the fertilizing practices of Japan is given.

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THE SILT PROBLEM AT SPRING LAKE, MACOMB, ILLINOIS.

By J. B. Stall, L. C. Gottschalk, A. A. Klingebiel, E. L. Sauer and E. E. DeTurk; State Water Survey Division, Urbana, Ill., Report of Investigation No. 4. 1949.

Spring Lake, the municipal water supply reservoir at Macomb, Illinois, has lost 47.3 per cent of its original capacity by siltation since its construction in 1927. The loss has been at the rate of 2.32 per cent per year. At this rate the lake would be practically full of silt in another 20 to 25 years. The capacity of the reservoir will be inadequate by 1953 to furnish the full needs of the city in the event of a severe drouth.

The 14.23 acre-feet of sediment which has been deposited in Spring Lake every year represents an annual loss of \$3200 of the original cost of the construction of the reservoir. At 1948 price levels it would cost approximately \$7500 annually to replace this storage capacity which is lost to sediment each year. The lake has received, on an average, 1.44 tons of sediment from each acre of the watershed per year.

More than 95 per cent of the sediment in Spring Lake comes from sheet erosion. It is estimated that a complete protective program on this watershed as outlined in this report would reduce sediment damages by 80 per cent.

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VEGETATION OF AN ABANDONED PRAIRIE-DOG TOWN IN TALL GRASS PRAIRIE.

By Ben Osborn and Philip F. Allan; Ecology, Vol. 30, No. 3, pp. 322-332. July 1949.

The plant cover around one former prairie-dog colony in the Wichita Mountains Wildlife Refuge in Oklahoma was examined after its abandonment

by the prairie-dogs in 1946 and found to exhibit distinct concentric zonation. The composition of the vegetation on this area was studied, and the history of the prairie-dog colony traced in relation to vegetation changes and land use. The climax cover of the site is the tall grass type of the True Prairie, normally dominated by big bluestem, little bluestem and Indiangrass with lesser amounts of other tall and mid grasses.

The stages of secondary plant succession, as represented by the concentric zones, were: (1) mat forbs, dominated by rushpea and shaggy purslane; (2) annual threeawn, dominated by prairie threeawn; (3) threeawn and forbs, dominated by prairie threeawn and western ragweed; (4) threeawn and perennial grasses, dominated by prairie threeawn, poverty dropseed, tumble windmillgrass, and buffalograss; (5) short grasses, dominated by blue grama and prairie threeawn; (6) sub-climax mid grasses, dominated by silver bluestem and sideoats grama; and (7) climax tall grasses, dominated by big bluestem, switchgrass, and Scribner panicum.

The prairie-dog seems to increase in numbers with the disturbance of the Climax tall grass cover and decrease as the Climax cover is restored.

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SOUTHWESTERN TREES AND SHRUBS.

By B. W. Allred; Sheep and Goat Raiser, Vol. 29, No. 12, p. 32. September 1949.

The author describes the giant Yucca and discusses its distribution and use.

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MACHINERY FOR THE CONSERVATION FARMER.

By J. C. Dykes; Agr. Eng., Vol. 30, No. 9, pp. 420-422 and 428. September 1949.

The author lays the basis for discussing the machinery needs for the conservation farmer by explaining and illustrating what he means by a conservation farmer and conservation farming.

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PIEZOMETERS FOR GROUND-WATER FLOW STUDIES AND MEASUREMENT OF SUBSOIL PERMEABILITY.

By R. C. Reeve and Max C. Jensen; Agr. Eng., Vol. 30, No. 9, pp. 435-438. September 1949.

This paper deals with studies made in Gem County, Idaho, in which small-diameter piezometers were used for studying subsoil conditions and flow of underground water. Small diameter piezometers were used to investigate the flow of ground-water in the area of an open drain and for

making permeability measurements of subsoil materials.

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OKLAHOMA SEEKS TO FIND BEST METHODS TO CONTROL SOIL EROSION, ON SHALLOW, HIGHLY ERODIBLE RED PLAINS SOIL.

By Harley A. Daniel, Harry M. Elwell and Maurice B. Cox; Southwestern Crop and Stock, Lubbock, Texas, Vol. 3, No. 9, pp. 17, 20-21. September 1949.

The authors summarize results obtained at the Red Plains Soil Conservation Service Experiment Station at Guthrie, Oklahoma. The investigations covered include cropping systems on terraced and unterraced land, cover crops and fertilizers, methods of establishing and maintaining plant cover, gully control, and pasture and meadow development and management. The summaries cover the period 1930-48, inclusive.

The most effective and practical method of erosion control yet developed for growing cultivated crops probably include (a) a well planned system of terraces, (b) contour cultivation, (c) fertility treatment, (d) and cropping system. The exact combination of these practices, however, must be determined by the various soil capabilities and climatic conditions where they are applied.

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BEACH EROSION.

By Joseph M. Caldwell; The Scientific Monthly, Vol. 69, No. 4, pp. 229-235. October 1949.

A basic factor in beach erosion is the fact that in most localities a rather delicate balance exists between the forces tending to erode the beach by carrying the sand away and the forces tending to move sand into the beach from other areas. Usually both sets of forces - those of accretion and those of erosion - are present, and it is the difference between the two that determines whether a beach is eroding or building up. Where the difference is slight, a fairly stable beach configuration is evident, although after a considerable period - say, fifteen or twenty years - the cumulative effect of the dominant force becomes apparent; where the difference is large, the beach may show radical changes in a year or two.

Any unusual condition, whether natural or man-made, may upset the balance in such a way that what has been a very stable beach may quickly show significant erosion or accretion. The cumulative effect of wave action on a specific beach is somewhat dependent on the type of shoreline in the area.

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EXPERIMENTS IN THE CONTROL OF SOIL EROSION IN CENTRAL NEW YORK.

By G. R. Free, E. A. Carleton, John Lamb, Jr., and A. F. Gustafson; Cornell Univ., Ithaca, New York, Agr. Exp. Sta. Bul. 831. April 1946.

Investigations were started at Geneva in 1936 and at Marcellus in 1937 to study the extent of past erosion, to determine the types of rains that cause erosion, and the season of the year in which erosive rains fall. Comparison is being made of common tillage and cropping practices with those that have been found to hold water on the land until it is taken up by the soil. These investigations also include the development of new ways to hold the soil against erosion and the improvement and maintenance of crop yields.

It has been found that the use of manure, chopped hay and leaves as a surface application, improved growth and yields on badly eroded soil on a five-per cent slope at Geneva. Fallow Dunkirk silty clay loam suffered far greater losses of water and soil than when devoted to a vegetable-crop rotation. Fallow land loses more organic matter and soil than when soybeans or grasses are being grown. Steep slopes erode more than gentle ones and long slopes erode more than short ones. Contour tillage and contour strip cropping reduce runoff and soil loss and increase crop yields. Leaving trash or crop materials on the surface holds water and soil. Land that had suffered slight erosion produced five times the yield of grapes as land which had been severely eroded.

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THE VALUE OF CROP ROTATIONS FOR SOIL AND WATER CONSERVATION.

By R. E. Uhland; USDA, SCS-TP-83. July 1949, and Jour. Soil and Water Conservation, Vol. 4, No. 4, pp. 146-152 and 160. October 1949.

The erosion process involved must be well understood before an effective soil and water conservation program can be developed. This involves a knowledge of rainfall intensities and frequencies, the erosiveness of the soil by wind and water, drought hazards, length of growing season and other factors.

In planning crop rotations for soil and water conservation, full consideration must be given to the natural forces and resistances to be dealt with. Crop rotations must be adjusted and fitted to the specific requirements of the local climate, soil, farmer and farm enterprise. Crop rotation, to be effective, must be designed to provide a good surface cover, either living vegetation or crop residue at all times, and especially for those periods when destructive rains or winds are expected to occur with greatest frequency.

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CONSUMPTIVE USE OF WATER IN THE IRRIGATED AREAS OF THE UPPER COLORADO RIVER BASIN.

By H. F. Blaney and W. D. Criddle; USDA, SCS. April 1949.

The purpose of this study was to determine the rates of water consumption at sites of use by agricultural crops and natural vegetation in various irrigated areas of Arizona, Colorado, New Mexico, Utah and Wyoming in the Upper Colorado River Basin. Estimates of unit use by the various agricultural crops and native vegetation in this basin are based largely on results obtained from studies in other areas of the west transferred to the upper Colorado River Basin by correlating existing consumptive use data with monthly temperature, per cent of daytime hours and precipitation for the frost-free period or irrigation season and for the entire year. The coefficients so developed for different crops are used to transfer consumptive use data from one section to other areas where only climatological data are available.

Some of the factors considered as influencing the rate of consumptive use and on which data were obtained are: The beginning date and length of irrigation season, number of irrigations applied each year, amounts of water applied each year, planting and harvesting dates, average yields, soil textures and root zone depths, rates at which water percolates into the soil, and several other factors of lesser importance.

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ABSTRACTS OF RECENT PUBLISHED MATERIAL ON SOIL AND WATER CONSERVATION.

By J. H. Stallings; USDA-SCS, Washington 25, D.C. September 1949.

The purpose of this publication is to bring together a summary of current information about soil and water conservation for ready reference to those who are actively engaged in soil conservation work. It contains abstracts of papers published by personnel of the Soil Conservation Service and cooperating agencies. It consists of subject matter index, abstracts, and author index.

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FERTILIZE CORN FOR HIGH YIELDS.

By B. A. Krantz; N. C. Agr. Exp. Sta. Bul. No. 366. June 1949.

Field experiments were conducted over a wide range of soil and climatic conditions from 1944 through 1948. The aim was to find out how to fertilize corn effectively when good hybrids were used along with good cultural practices. Nitrogen was found to be the most limiting factor for

producing corn. Yields increased about one bushel for each two pounds of nitrogen applied within the range of response to nitrogen. Climatic conditions greatly influenced the amount of response to nitrogen, although substantial responses were obtained under droughty conditions when good management practices were followed. Under droughty conditions in heavy Piedmont soils, soil moisture was conserved and yields increased by mulching after the last cultivation. The conventional side-dressing method of nitrogen application was as good or better than the plow-sole method.

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BILL EBBS' SIPHON PRIMER.

By G. L. Wilkinson; The Reclamation Era, Vol. 35, No. 10, pp. 229-230. October 1949.

The siphon primer, an uncomplicated, inexpensive gadget attached to the end of a siphon tube bids fair to solve a lot of problems for the irrigation farmer. With this new device attached to the end of a siphon tube, all that is necessary is to dunk one end of the tube into the water, flip the curved tube across a ditch bank and the water flows as if it were coming from the old mill stream. Water remains in the siphon several hours after the water has stopped flowing in the ditch. The siphon doesn't lose its prime; does not require resetting. When the flow of water is resumed in the ditch the siphon valve automatically starts functioning again. It has water saving properties, as it makes possible perfect control of the streams entering each furrow, and prevents waste which too often results from over-large apertures or flows from the ditch.

This siphon valve is extremely simple. It is made of rubber with various sizes being designed to fit any standard metal or plastic siphon. From the end where it slips on the siphon, the valve flares into an "L". A valve designed to operate on a 2-inch siphon measures about 4 1/2 inches at the mouth or outlet. Other valves vary in proportion to the size of siphons on which they are fitted.

The valve, constructed entirely of heavy rubber, remains open while water is flowing through. As the flow decreases, the valve opening also is reduced. When the flow of water ceases completely, the valve automatically closes tight.

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A COMPARISON OF TILLAGE IMPLEMENTS AND THEIR EFFECT ON CROP YIELDS.

By R. L. Cook and F. W. Peikert; Mich. Agr. Exp. Sta. Quarterly Bul. Vol. 32, No. 1, pp. 104-118. August 1949.

This paper presents the results, obtained during

the past 3 years, from several methods of tillage with different machines or combinations of machines. Corn, sugar beets, oats, sweet clover, alfalfa, and beans were grown on two types of soil. The results indicate that under average soil conditions, where the surface was practically free of vegetation, the yields obtained following the various machines were about the same as those where conventional tillage was used.

On the heavy soil the yields resulting from the use of the sub-base plow were slightly higher than those obtained from plots turned with the conventional plow. The "once-over" soil preparation made possible by the plow-packer or mulcher attached directly to the conventional plow seems to offer good possibilities for decreasing cost of seedbed preparation while still maintaining yields comparable with those obtained by conventional methods.

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SIXTEENTH SEMI-ANNUAL PROGRESS REPORT OF THE SOUTHERN PLAINS EXPERIMENTAL RANGE, WOODWARD, OKLAHOMA.

By E. H. McIlvain, D. A. Savage, Leslie E. Johnson and D. E. Howell. Fall 1949.

The authors present an eight-year summary of results of grazing, feeding and other range improvement studies on the Southern Plains Experimental Range.

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USING TALL FESCUE IN SOIL CONSERVATION.

By R. Y. Bailey and L. B. Scott; USDA, Leaflet No. 254. August 1949.

Tall fescue has many characteristics that make it a promising grass for conservation farming in the South. It will grow better on wet-land than other grasses in common use. It will also grow well on droughty slopes. It is a cool-season grass that does well with legumes in soil-conserving crop rotations. Since it makes good pasture and stays green in winter, it cuts down on the acreage needed for feed crops. And it has the deepest and strongest root system of any grass now grown in the South. This root system holds up cattle on wet land where they would otherwise mire; it makes an excellent turf in waterways; and it controls erosion on steep slopes.

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MULTIFLORA ROSE FOR LIVING FENCES AND WILDLIFE COVER.

By W. L. Anderson and F. C. Edminster; USDA Leaflet No. 256. 1949.

Multiflora rose will make a fence that will keep

both your livestock and your soil within its boundaries. A multiflora rose fence is one of the least expensive fences that can be established and one of the cheapest to maintain. One thousand plants will give you 1,000 feet of living fence. Where fences of wire or wood do not shelter birds or rabbits, multiflora rose furnishes welcome cover for farm wildlife. As compared with the usual fence, a living fence of multiflora rose is a thing of lasting beauty. In the spring it carries masses of white blooms; in the winter its red fruits brighten the fields. Unlike other fences that must be repaired or replaced, multiflora rose fences last a lifetime and will continue to serve your children.

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PRODUCTION AND INCOME COMPARISONS ON DIFFERENT CLASSES OF SANDY SOILS, 1944-48.

By H. O. Anderson and P. E. McNall; La Crosse and Madison, Wis., Multilithed. September 1949.

This report contains a summarization and analysis of five years of data obtained from 67 farms, of which 37 were largely on sandy loam soils and 30 farms in the main were on sand. Cropland in the former group consisted chiefly of soils such as Chetek, Goetz, Oneil, Ottawa, Scandia and Superior sandy loams. Plainfield and Coloma sands typified most of the soils in the sand group.

Per acre crop yields on the 37 sandy loam farms were at least 30 per cent higher than were the yields for the 30 sand farms for the period 1944-48.

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FARM BUSINESS ANALYSIS LINCOLN COUNTY, 1948.

By H. O. Anderson, P. E. McNall, Wm. Lonsdorf, Joe Jackelen, King Oelhafen, Martin Burkhardt and Allan Bullis; La Crosse and Madison, Wis., Multilithed. September 1949.

This report includes data from farm records of 33 G. I. on-the-farm trainees, 20 Farmers Home Administration clients and 6 farm records supervised directly by the Agricultural Experiment Station. There was very little difference in average productions, income and costs between the two major groups mentioned above except for the higher investment in land, buildings, equipment and livestock on the trainee's farms. Annual depreciation and interest charges, therefore, are greater on these farms.

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CANAL LININGS TESTED IN FIELD.

By C. W. Lauritzen and O. W. Israelsen; Soil Conservation, Vol. 15, No. 4, pp. 80-82 and 89.

November 1949.

This article cites an instance in which a group of irrigators and a number of other interested concerns pooled their efforts to advance canal-lining research. Most of the seepage from any canal usually occurs in localized sections. The first step in undertaking a canal-lining program is to determine the location of heavy losses. It was found that 57 per cent of the water lost from the canal under study was lost in a canal length of about 2,200 feet. The field test consists of 729 linear feet of concrete, 400 feet of shotcrete, 300 feet of precast concrete slabs, 100 feet of gravel-covered soil-bentonite in the main canal, and 113 feet of butyl-coated fiberglass linings in one of the major laterals.

The concrete linings included two thicknesses, 3-inch and 2-inch, with and without reinforcing, and two types of finishes. Shotcrete linings of four different specifications were installed to obtain further information on the comparative value of this type of lining, the need for reinforcing and the minimum thickness which would be required to be serviceable under conditions in Utah.

There has not been sufficient time to test the relative durability of the various experimental linings. To date, all are intact and functioning satisfactorily.

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PROFITS FROM IRRIGATED PASTURE.

By A. J. Webber; Soil Conservation, Vol. 15, No. 4, pp. 84-86. November 1949.

Murray Webber, dairy farmer of St. George, Utah figures that irrigated pastures are worth \$230 an acre annually.

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PROGRESS REPORT NO. 10 OF SILT LOAD OF TEXAS STREAMS (1947-1948).

By D. W. Bloodgood; Board of Water Engineers, Austin, Texas. August 1949.

The purpose of the silt studies is to make a determination of the characteristics of the suspended silt load of Texas streams. The tenth annual progress report for silt loads of Texas streams is one of a series that have been prepared annually since 1939. This report contains a description of the equipment used in obtaining the water samples, the techniques used in the laboratory and computation of date.

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SOUTHWESTERN TREES AND SHRUBS - CANDELILLA OR WAX PLANT.

By B. W. Allred; Sheep and Goat Raiser, San Angelo, Texas, Vol. 30, No. 1, p. 20. October 1949.

The author describes Candelilla or wax plant, and discusses its economic and soil conservation values.

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CULTIVATION FOR WEED CONTROL IN COTTON.

By Laurence E. Creasy and Linton E. Cowart; Agr. Eng., Vol. 30, No. 10, pp. 490-491 and 495. October 1949.

The authors discuss the use of flame cultivators and chemicals for weed control in cotton. The advantages, and disadvantages and limitations of each in light of present knowledge are set forth.

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THINNING COTTON TO A STAND WITH FLAME.

By Thomas L. Baggett; Agr. Eng., Vol. 30, No. 10, pp. 489 and 495. October 1949.

The author discusses the factors essential to the successful use of flames in connection with thinning cotton. The discussion is based on studies extending over a period of three years.

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CULTIVATION AND WEED CONTROL OF COTTON.

By E. N. Scarborough; Agr. Eng., Vol. 30, No. 10, p. 491. October 1949.

The author discusses the results of one year's investigation with the use of chemicals in controlling weeds in cotton. Varying results were obtained.

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FIRST THINGS FIRST - KNOW YOUR LAND AND HAVE A PLAN BEFORE STARTING CONSERVATION FARMING.

By Albert B. Foster; USDA, SCS-PA-69. 1949.

The author explains the procedure for finding the correct use for each acre of land on the farm and for making plans for a farm that will put each acre to work at its best use. These are considered the first two steps necessary for a real conservation program.

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LAND USE EXPERIENCE IN SOUTHERN GREAT PLAINS.

By H. H. Finnell; USDA, Cir. No. 820. October 1949.

The limitations of land must be recognized

clearly before good judgment in land use choices on the plains can be used. Experience has proved that shallow, moderately sandy and deep, loose sand-hill soils of gentle slope or steeper cannot be kept productive under cultivation anywhere in the 14- to 20-inch rainfall belt. Shallow-depth hard lands, both flat and sloping, have failed in all areas of less than 18-inches average rainfall. Nearly level, medium-depth, moderately sandy lands, on the other hand, stood up well with suitable practices under rainfall as low as 16-inches. Deep, nearly level, hard lands, the best of the High Plains wheat soils, can be farmed with appropriate precautions wherever found. The productivity of high-capability lands, can be as seriously affected by topsoil removal as that of low-capability lands.

These conclusions are based on a study made of conditions in 20 counties centering on the junction of Colorado, Kansas and Oklahoma. A physical survey of the land in the area was first made in 1936 and again in 1947. The 1936 survey provided a record of the land use in effect at that time and provided descriptions of soils, slopes, vegetation and a record of the nature and extent of soil erosion that had taken place before that date. The 1947 survey served as a basis for determining land use experience under average farm conditions. The purpose was to determine what kinds of lands had been abandoned and which abandoned lands had been reclaimed since 1936 and what has since happened to them, in order to establish a sound basis for present and future action.

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A NEW APPRAISAL OF ORCHARD COVER CROPS.

By John T. Bregger; Proc. of State Horticultural Soc. (Tenn.), pp. 73-74. 1949.

Cover crop management is in many ways the key to cover crop effectiveness as a soil and moisture conserving practice. To get the most out of an orchard cover crop it must have the greatest possible mulching value and the longest period of effective occupation on the land. For a perennial species this is a natural sequence, though frequent mowing will deposit the top growth on the ground and decrease transpiration of soil moisture. For annual species which require natural or artificial reseeding, there are varying periods where cultivation may expose the soil to direct rainfall and a significant amount of runoff. The ideal treatment of an annual cover crop results in as much or more soil protection from the dead residues as was secured from the growing cover. Thus we may have winter protection from residues of a summer cover crop and summer protection from residues of a winter crop.

With sprinkler irrigation, cover crops are playing an even newer role. The importance of a ground cover when water is being applied to the

soil cannot be overemphasized, but with sprinkling irrigation it is essential to secure the highest infiltration rate and allow a faster rate of application.

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EXPERIMENTAL USE OF FERTILIZER IN THE PRODUCTION OF FISH-FOOD ORGANISMS AND FISH.

By Robert C. Ball; Mich. Agr. Exp. Sta. Tech. Bul. No. 210. March 1949.

Twenty-one ponds at three Michigan fish hatcheries were used in the summer of 1946 for experimental work to determine the value of fertilizers in the production of fish. Certain operational difficulties made evaluation of the effects of the fertilizer on the bass-bluegill combinations, and on the minnows difficult, but the general indication was that there was a greater production of these fish in fertilized waters. There was a more clear-cut indication of greater production of crayfish, tadpoles, and other fish in the fertilized waters and it was in the production of fish-food organisms, the lower invertebrates, aquatic insects, and plankton that the greatest difference was noted. The production of invertebrate organisms, as determined by dredge sampling, was 42 per cent greater in the fertilized ponds than the non-fertilized ponds, and the production of plankton organisms was 330 per cent greater.

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STUBBLE MULCH MANAGEMENT FOR WATER CONSERVATION AND EROSION CONTROL ON HARDLANDS OF THE SOUTHERN GREAT PLAINS.

By Charles J. Whitfield, C. E. Van Doren and Wendell Johnson; Texas Agr. Exp. Sta. Bul. No. 711. June 1949.

This bulletin contains a resume of the stubble mulch tillage studies carried on the past 7 years at the Amarillo Conservation Experiment Station. It concerns studies made of stubble mulch practices in growing winter wheat on Pullman silty clay loam, a deep, fine textured slowly permeable hardland soil, high in fertility and moderately high in organic matter under native conditions. Four types of implements, two plows and two sub tillage machines, were used on plots planted to wheat year after year. These were the oneway plow, the moldboard plow, the Noble cultivator, and a sub tillage machine developed at the station. Two types of implements, the oneway plow and the Amarillo sub tillage machine, were used on plots planted to wheat one year and fallowed the next year.

An average of 2.6 bushels, or 21 per cent, more wheat per acre was obtained from the continuous wheat plots which were sub tilled than was produced after using the moldboard plow, and 1.9

bushels, or 14 per cent, more than where the oneway was used. An increase of 2.8 bushels, or 15 per cent, was recorded in favor of the subsurface sweep machine over the oneway in a wheat and fallow system. These differences in yield are highly significant. The effects of the stubble mulch tillage have been cumulative through the 7-year period. The improvement was due in part, at least, to an improved physical condition and a better moisture-fertility balance in the soil.

In addition, fallowing has made possible, the production and maintenance of a stubble mulch to protect the soil from blowing regardless of the occurrence of periods of subnormal precipitation.

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CHEMICAL WEED CONTROL.

By B. H. Grigsby, Boyd R. Churchill, Charles L. Hamner and Robert F. Carlson; Mich. Agr. Exp. Sta. Cir. Bul. 214. May 1949.

The use of chemicals for controlling weeds has made remarkable progress in the last 5 years. The cost of chemical weed control is often less than that of hand labor, but there are situations where chemical control may be equally as expensive and no more effective. In other situations, cost may not be a factor and the problem becomes that of selecting a chemical method.

This publication was prepared to set forth those facts and methods which have been of value in farm practice.

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SOME OF THE SOIL EROSION PROCESSES.

By W. D. Ellison; Bureau of Yards and Docks, Dept. of the Navy, NavDocks p. 30, Soil Conservation, pp. 29-38. 1949.

This discussion of soil erosion is limited to that which is caused by water during rainstorms. The soil erosion process is defined as one of detaching and transporting soil materials. It consists of two independent sequential happenings i.e., soil detachment and soil transportation. The water which causes this detachment and transportation is the erosive agent. Properties of the soil as well as properties of the erosive agents influence the erosion process.

Erosion control practices are employed to reduce the soil erosion hazards. These practices fall into two major classes i.e., vegetal covers or those that intercept the falling raindrop to control erosion by raindrop splash and mechanical devices which regulate concentration and velocity of surface runoff.

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SOME NAVY PROBLEMS IN CONSERVATION.

By W. D. Ellison; Bureau of Yards and Docks, Department of the Navy, NavDocks P-30, Soil Conservation, pp. 3-9. 1949.

Soil conservation practices are designed for a two-fold purpose. First, they are to control soil erosion; and second, they are to maintain the productivity of the land. Achievement of the first of these does not assure the second, but it is an essential first step in achieving the second. The Navy's interest in soil conservation is to control soil erosion and maintenance of productivity to the extent that the soil will grow the vegetation necessary to make erosion control possible.

FIRE AS A MEANS OF CONTROLLING VELVET MESQUITE, BURROWEED, AND CHOLLA ON SOUTHERN ARIZONA RANGES.

By R. R. Humphrey; Jour. Range Management, Vol. 2, No. 4, pp. 175-182. October 1949.

Many desert shrubs growing in Southern Arizona can be rather effectively controlled by broadcast burning. Control is more nearly complete on burroweed than on the other species observed, although even on velvet mesquite trees 5 to 10 feet in height, a rather effective kill has been observed.

Although the total number of grass plants, regardless of species, was greater after burning, the evidence as to the effect of fire on the various grasses is rather inconclusive.

GROWTH PERIODS AND HERBAGE PRODUCTION OF CHEAT-GRASS AND RESEEDED GRASSES IN SOUTHWESTERN IDAHO.

By A. C. Hull, Jr.; Jour. of Range Mgt., Vol. 2, No. 4, pp. 183-186. October 1949.

The only advantage of cheatgrass is that it is present in considerable amounts in some years without the labor of reseeding. This alone is not enough on which to base a livestock operation. Economical operation demands that livestock can safely graze on the smallest herbage production to be expected in a poor year. To use this basis with cheatgrass would mean a very limited operation if no supplemental feeding was done.

Crested wheatgrass begins to grow earlier in the spring, remains green longer in the summer, generally produces more herbage, and fluctuates less in production from one year to another. The other species also provide one or more of these described failures. Seeding crested wheatgrass, or combinations of other grasses which grow earlier and later, can extend the period of

green growth considerably.

KILLING RIBES WITH 2, 4-D AND 2,4,5-T.

By H. R. Afford; Jour. of Range Mgt., Vol. 2, No. 4, pp. 201-205. October 1949.

The author summarizes results from greenhouse and field tests from 1944 to 1948 in killing ribes with 2,4-D and 2,4,5-T. He describes the methods and equipment that were most effective in field practice, and points out some of the factors now known to affect the killing action of these herbicides.

FLEXIBLE FARMING SAVES MOISTURE.

By Harley A. Daniel; What's New in Crops and Soils, Vol. 2, No. 1, pp. 18-19 and 23. October 1949.

A good wheat crop requires above-average rainfall - either this, or more water must be stored in the soil by conservation practices. Cropping plans must be kept flexible in order to make the best use of the moisture available. The task of working out the most efficient use of the soil and moisture resources of the Southern Great Plains requires the abandoning of some of the traditional ideas about cropping systems. We must work in close harmony with nature and not against her.

By careful study of the conditions of soil and moisture - the most important of which can be measured before sowing time - the best use can be made of the limited moisture available. A flexible cropping plan not only reduces the risks in wheat production, but even more important, is less likely to lead to waste of valuable soil water on a wheat failure.

NEW CHEMICALS KILL CRABGRASS WITHOUT INJURING GOOD TURF.

By Ralph E. Engel; What's New in Crops and Soils, Vol. 2, No. 1, p. 27. October 1949.

Seven phenyl mercury compounds tried in 1948 on a turf heavily infested with smooth crabgrass gave good control of crabgrass. They appeared to be very similar, both in their ability to kill crabgrass and in the amount of injury to desirable grasses. These materials gave a minimum of injury, as compared to other chemicals tested.

ALUMINUM AGE OPENS NEW ERA IN FARM IRRIGATION.

By Roscoe Fleming; What's New in Crops and Soil, Vol. 2, No. 1, pp. 10-12 and 23. October 1949.

The author discusses the rapid strides being made in the use of sprinkler irrigation. He points out a number of advantages it has over the flood irrigation.

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HUNGRY CROPS TELL THEIR STORY.

By Malcolm H. McVicker; What's New in Crops and Soils, Vol. 2, No. 1, pp. 14-15. October 1949.

Plants are living things which must have certain nutrient elements for normal growth and development. Under-fed plants, like undernourished people, tend to become puny, sick, and ill-formed. Hungry crops display their symptoms for everyone to see.

The author describes how nutrient deficiencies can be determined by examining the foliage of the growing plants.

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AMMONIFICATION, NITRIFICATION AND NITROGEN FIXATION IN THE SOILS OF TEXCOCO.

By A. Sanchez Marroquin, V. Carreto and R. Garcia; Soc. Mex. de Hist. Nat. Rev., Vol. 8, pp. 29-46, (Translated from Spanish by Roy C. Dawson). December 1947.

The purpose of this study was to contribute to the knowledge of the agricultural quality of the alkaline soils in the Lake of Texcoco area by means of microbial tests which can serve as an index to fertility. These tests included ammonification, nitrification, nitrogen fixation and some rapid microchemical soil tests.

The chemical analysis indicated that the non-cultivated soils showed excessive amounts of K, Ca and Mg, where P was found deficient in some of the samples. The concentration of total soluble salts was higher than 1 per cent in those samples which showed lower results by the bacterial tests and high concentrations of Ca, Mg and K. Most of the soils were found deficient in organic matter. The value of the microbiological methods to estimate soil fertility in these alkali soils was considered satisfactory.

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MICROBIOLOGY OF THE SOIL: A NEW DIRECT MICROSCOPIC TECHNIQUE.

By Yao-Tseng Tchan; Ann. Inst. Pasteur 73, pp. 695-696. July 1947. (Translated from the French by Roy C. Dawson)

The author proposes a new microscopic technique

for making biological analysis of soil. It consists of moulding the soil in a Petri dish, with or without the addition of chemical substances, depending on the objective in view; after a period in the incubator at 28°, a slide is impressed against its surface; the microscopic examination is made after fixing in the flame and staining with phenolic erythrosine. Colonies of generally homogeneous bacteria, filaments of actinomycetes and of fungi with their fructifications can be distinguished in the microscopic field. The impressions can be made upon slides repeatedly during the course of the culture, the whole giving a true moving picture of the evolution of the flora.

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SOUTHWESTERN TREES AND SHRUBS - CATCLAW ACACIA.

By B. W. Allred; Sheep and Goat Raiser, Vol. 30, No. 2, pp. 12-13. November 1949.

The author describes the Catclaw Acacia plant and discusses its economic and soil conservation values.

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HOW CAN I CLEAN MY GRASS SEED?

By C. B. Webster; Sheep and Goat Raiser, Vol. 30, No. 2, pp. 12-13. November 1949.

The author explains the advantage of clean grass seed and discusses some of the most important machines available for cleaning seed.

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THE HYDROLOGY OF A SMALL AREA NEAR AUBURN, ALABAMA.

By D. A. Parsons; USDA, SCS-TP-85. September 1949.

This is a story of the manner of movement of water to and from a particular farm pond and its supporting watershed. Measurements were made of rainfall, temperature, pond level, spillway outflow, evaporation, seepage, and ground-water levels. There are derived from these data knowledge of the magnitudes of ground-water storage, ground-water flows to the pond and to deep seepage, surface runoff, infiltration rates, evapo-transpiration rates, and total seepage losses from the pond.

The quantitative values are strictly applicable only to the area under study. Some of the measurements are applicable, in the absence of better information, to areas judged to be similar. The water of many ponds and watersheds will behave in many respects in similar fashion, but with different magnitudes and frequencies.

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WATER EROSION CONTROL ON CULTIVATED LAND.

By J. H. Stallings; Better Crops with Plant Food, Vol. 33, No. 10, pp. 15-20 and 45-50, Illustrated December 1949 and USDA, SCS, Multilithed. November 1949.

The author discusses the major roles of the falling raindrop and surface flow in the soil erosion process. The primary role of the falling raindrop is the detachment of soil particles, whereas that of surface flow before concentrating into rills and gullies, is transportation of soil.

The falling raindrop applies its energy from above, and its chief role in the erosion process is detaching soil particles. It requires remedial measures entirely different from surface flow which applies its energy horizontally across the surface of the ground and whose chief role in the erosion process on cultivated land is transporting soil material. Measures aimed at controlling the effects of the falling raindrop, to be effective, must be designed to intercept and de-energize the raindrop before it strikes the ground. Those measures aimed at controlling surface flow must be designed to regulate concentration and to retard the movement of free water as it flows over the surface of the ground.

The secret of controlling erosion caused by the falling raindrop is the dissipation of the energy contained in it before it comes in direct contact with the ground surface. This can be accomplished by the proper use of vegetal covers, either living or dead. The secret of reducing the damage caused by surface flow is to control its concentration and to retard or regulate its velocity.

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ENGINEERING ACTIVITIES OF THE SOIL CONSERVATION SERVICE.

By John G. Sutton; USDA, SCS, Mimeo. Address given before Missouri Soc. Professional Engineers, Cape Girardeau, Missouri, October 28, 1949.

The author discusses the activities of the Engineering Division of the Soil Conservation Service.

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PROGRESS REPORT ON WEED CONTROL IN IRISH POTATO FIELDS.

By L. L. Danielson; Va. Agr. Exp. Sta., "The Vegetable Growers News", Vol. 4, No. 5, p. 3, Norfolk, Va. November 1, 1949.

Trials with the use of 2,4-D for the control of weeds in Irish Cobbler potatoes were conducted during 1947 and 1948. The results indicate that

time of application of 2,4-D was very important if injury was to be avoided and they also gave good prospects for the use of this chemical for the control of weeds during the early stage of growth by a pre-emergence treatment or control of weeds which develop after the last cultivation by a treatment applied at that time.

Results of tests conducted in 1949 show that the Cobbler potato was tolerant of the 2,4-D treatments applied at pre-emergence during the late vegetative stage and after flowering. Early weed growth was satisfactorily controlled by the pre-emergence treatment but the summer weeds were not controlled. The late vegetative, full flowering, and after flowering treatments gave excellent control of grass weeds as well as broad leaf weeds.

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FACTORS THAT GIVE VALUE TO LAND OR BASIC LAND VALUES.

By Karl Harris; Ariz. Agr. Exp. Sta. Bul. 223. July 1949.

The material presented in this publication should prove useful to land appraisers, landowners and prospective owners as a tool in establishing a reasonably definite value on a given piece of land. The proposed values, based upon years of experience with various soil types, are general averages worked out from numerous samplings.

It is not expected that the values given by the author will fit all situations. With usage, improvements and refinements should be effected which will enhance the worth of this method of land evaluation.

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FROST GUARD - A NEW INVENTION.

By Raymond Schuessler; Farmers Digest, Vol. 13, No. 7, pp. 54-56. November 1949.

A machine has been invented by Arthur W. Farrell and coworkers at the Michigan Agricultural Experiment Station, the use of which not only eliminates the danger of frost, but bids fair to lengthen the growing season. Hundreds of tests have been carried on in 11 states without a single failure. The machine makes use of infra-red rays which are capable of keeping the temperature of plants and the soil several degrees above that of the surrounding atmosphere.

The Frost Guard is a generator for producing heat energy, transforming this energy into infra-red rays and distributing the rays over a certain protected area. When directed towards the earth, they tend to compensate for the loss of heat from the earth due to radiation. It stands on a strip of steel pipe which can be adjusted to protect

20 foot fruit trees or ground hanging berries. Rising from this is a chimney, a hollow tube of sheet steel. Topping the chimney is a shiney, pie-shaped reflector which directs the rays out and down to cover the required area. At the bottom is an oil burner fed by a simple pump, powered by a storage battery. A small motor pumps kerosene from a barrel into the burners in the machine, and the heat is radiated from aluminum reflectors. Each machine costs about \$350 and approximately 75 cents an hour to run, burning from 8 to 10 gallons of kerosene per hour when in operation. Each unit protects about an acre of crops when used in groups.

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SURFACE RUNOFF SUPPLY ESTIMATES BASED ON SOIL-WATER MOVEMENTS AND PRECIPITATION PATTERNS.

By Leonard Schiff; USDA, SCS-TP-86. October 1949.

The object of this paper is the development of a method of utilizing transmission rates, antecedent soil moisture, changes in soil moisture, and rainfall patterns for estimating surface runoff. The method presented involves the concepts of (1) transmission rates of specific magnitudes may be applied to soils of reasonably similar hydrologic characteristics; (2) transmission rates may be converted into corresponding infiltration rates; and (3) an 'inplace' supply of water to the soil surface may be estimated. This 'inplace' supply may be translated into the hydrograph of stream flow for a given sub-basin. The hydrographs for the sub-basins may be combined for the entire basin. Estimates of the actual flow at any point must consider sub-surface flow where such flow is appreciable.

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THE PRODUCTION OF SEED AND FORAGE BY MOUNTAIN BROME AS INFLUENCED BY NITROGEN AND AGE OF STAND.

By R. H. Stark, A. L. Hafenrichter and K. H. Klages; Agron. Jour., Vol. 41, No. 11, pp. 508-512. November 1949.

This is a report of the results of a study made to determine the influence of different levels of nitrogen availability on seed production of a foundation seed field of Bromar mountain brome. The same field was used for 3 successive years to determine the effect of age of stand and of the interaction between age and nitrogen on seed production. The influence of these factors on yields of forage was also studied. The work was done on irrigated land so that the influence of differences in precipitation from year to year was not a factor affecting the results.

The average yield of seed was increased, each of the 3 successive years, with each additional amounts of nitrogen applied which ranged from 0

to 103 pounds per acre. The yield of seed declined as the age of the stand increased. All rates of application of nitrogen gave profitable returns in yield of seed, and there was no evidence that the upper limits had been reached with 103 pounds per acre of nitrogen. Applications of nitrogen increased forage production more than seed yield.

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EVALUATION OF DROUGHT HAZARD.

By Gerald L. Barger and H. C. S. Thom; Agron. Jour., Vol. 41, No. 11, pp. 519-526. November 1949.

The authors compute the probability of drought by evaluating rainfall requirements and characteristics.

The incomplete T-curve has been fitted to frequency distribution of n-week rainfall totals. The parameters in this equation were estimated by the method of maximum likelihood. This curve, when checked against the frequency histograms by the chi-square test, showed a good fit in most cases. Only when the frequencies exhibited a definite bi-modal tendency were the chi-square values greater than would be expected from random fluctuation.

From the probability integrals of the fitted curves, the likelihood of occurrence of a certain class interval of n-week rainfall totals can be estimated for each station. The probabilities of like amounts, x_a , or less for given durations at each station have been computed and, likewise, the probabilities of the proper base amounts, x_d , or less were estimated. These probabilities afford a basis for comparison of different areas with regard to rainfall distribution alone and also with regard to the likelihood of receiving the minimum amount of precipitation needed to produce a normal corn crop. Similarly, the probability of occurrence of any class of rainfall totals could be determined. The use of the distribution function is by no means limited to the drought problem.

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WEEPING LOVEGRASS FOR THE ARID SOUTHWEST.

By H. W. Staten; What's New in Crops and Soils, Vol. 2, No. 2, pp. 18-21. November 1949.

Weeping lovegrass is the most talked about and most promising grass for the arid southwest. It is easy to establish and usually produces some grazing the first year. It is a fast grower and has strong seedling vigor. It prefers sandy soil but will do well on any type of well-drained soil. It is adapted to a wide variety of conditions and produces an abundance of forage. When all other grasses are brown in mid-summer, weeping love-

grass is green.

Weeping lovegrass produces an abundance of forage. No other grass is equal to it in the southern Great Plains, when it comes to total forage production. It is a long-lived, hardy perennial and is not affected by any plant disease. It does not produce under-ground runners; therefore, it does not become a pest.

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THE USE OF SURFACE MINED LAND.

By L. E. Sawyer; Jour. Soil and Water Conservation, Vol. 4, No. 4, pp. 161-165 and 170. October 1949.

Revegetation of areas from which coal has been removed is a problem of major concern in many sections of the country. This article traces the development of a successful revegetation program of strip mined areas based on sound land use and research.

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APPLICATION OF STRIP CROPPING AND CONTOUR CULTIVATION IN THE NORTHEAST.

By John P. Jones; Jour. Soil and Water Conservation, Vol. 4, No. 4, pp. 153-160. October 1949.

The author discusses the use of strip cropping and contour cultivation in the northeast.

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PROGRESS REPORT CENTRAL GREAT PLAINS EXPERIMENTAL WATERSHED NEAR HASTINGS, NEBRASKA.

By John A. Allis, and M. L. Nichols; USDA, SCS Mimeo. September 1949.

This is a progress report covering the highlights of the work of the Central Great Plains Experimental Watershed near Hastings, Nebraska. The report covers the progress, comparison of peak rates and total amounts of runoff from cultivated and native grass watersheds and from plots under different land uses, yields, and other pertinent data. It consolidates information in several of the station's annual progress reports. The observations are based on short periods of record and are not conclusive, but indicate trends only.

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DESIGN AND USE OF THE POMONA SOIL-SAMPLING DEVICE.

By V. S. Aronovici, Harry F. Blaney and G. D. Clyde; USDA, SCS, Mimeo. June 1949.

The Pomona Soil Sampling Device and the techni-

ques of its application are described in this report. The main advantages of this device are its capacity to reach a six-foot depth and the adaptability of soil samples so obtained to various laboratory tests. Soil qualities such as volume-weight, pore-size distribution, moisture equivalent (tension method), coefficient of permeability, and percolation rates may be determined from such samples. Available space limits a detailed discussion of all tests but the methods are briefly outlined and the procedures summarized.

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SUGGESTED SOLUTIONS TO MAJOR FARMING PROBLEMS IN NORTHEASTERN ILLINOIS.

By N. R. Urquhart, E. L. Sauer and H. C. M. Case; USDA, SCS And Ill. Agr. Exp. Sta. Mimeo AE-2709, Urbana, Ill. November 1949.

This report describes major farming problems in northeastern Illinois and makes some suggestions for solving them. Although the slow permeability of soils, erosion, and loss of fertility constitute the major problems, closely allied to them are the problems of tenancy, insufficient livestock, and lack of the proper type of credit. Improvement in these related problems would facilitate the adoption of needed soil conservation measures and other desirable changes in systems of farming.

Proper land use in this area requires more land in hay and pasture. However, the increased roughages resulting from the shift from corn and soybeans to hay and pasture would need to be efficiently used by livestock in order to maintain farm incomes.

The tenancy situation appears to be most serious in the southern part of the area. During the past few years of high prices for grain, the land has been "corned and beaned" and little or no attention has been paid to maintenance of topsoil, organic matter, and soil fertility.

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GROUND CONSTRUCTION AND MAINTENANCE.

By Dept. of the Air Force; Air Force Manual No. 90-1, Washington, D. C. February 1949.

This manual discusses the construction phases of grounds treatments at air installations in the continental United States with suggestions on application to oversea bases, and the maintenance of grounds after initial accomplishment of treatments. It is designed to give all personnel directly concerned with grounds problems, information and outlines for effective and economical accomplishment of ground treatments.

The subject matter deals with the specific

grounds problems at airfields and at the associated facilities and includes treatment of all areas not occupied by pavements, buildings, railroads and other facilities. Since effective grounds treatments are profoundly affected by climate, soil conditions, type of aircraft and operational procedures, the procedures recommended are general in nature with the expectation that adaptations will be made to suit local conditions.

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AGGREGATION OF THE SILT AND CLAY SOIL SEPARATES IN RELATION TO YIELDS AND RUNOFF ON COASTAL PLAIN SOILS.

By S. J. Richards, O. R. Neal and G. D. Brill; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 23-26. 1948.

This paper presents data to show that on typical Coastal Plain soils aggregation has a significant correlation with the yields of some crops but not with others. On plots where the total silt plus clay content is less than 20 per cent, the per cent aggregation of these separates shows a significant negative correlation.

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DIRECT MEASUREMENT OF GASEOUS DIFFUSION IN SOILS.

By George R. Blake and J. B. Page; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 37-42. 1948.

The purpose of this study was to examine the diffusion process as it occurs on undisturbed soil in the absence of applied overall pressure differentials. It is believed that the only way of fully understanding the process as it occurs under natural conditions is to carry out studies on soils in the field where physical homogeneity does not exist. Relationships between diffusion and porosity of different soils are discussed. Diffusion rates are shown on soils under different relations and on soils where different tillage practices have been carried out.

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MORE FOOD FOR A HUNGRY WORLD THROUGH SOIL CONSERVATION.

By J. C. Dykes; World Construction, pp. 12-16. July-August 1949.

Soil and water conservation is an important work because we have not found a suitable replacement for the productive land of the world being lost through erosion. It is the productive land that produces practically all of our food, raw materials for clothing, and many of the raw materials for industrial products.

Had we a limitless supply of this resource, the

urgency of worldwide soil and water conservation would not be so great. Land used for crops is of major importance, and we know that we have only about four billion acres of immediately arable land left to provide the needs of more than two billion people. A world population that is increasing at the rate of about twenty million each year.

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EXPERIMENTS IN THE USE OF THE MICROSCOPE FOR THE STUDY OF SOIL STRUCTURE.

By Paul R. Day; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 43-50. 1948.

The author reviews previous work showing the use of microscopy in the study of soil structure, and attempts to test and evaluate the procedures already developed, improve these and develop new ones where necessary, and finally apply the most promising procedures to some of the problems of structure that confront the soil physicist.

The main problems encountered were those of preparation of materials for observation by means of apparatus already well known to microscopists. The main efforts were directed toward methods of preparing the samples. The merits and limitations of three of these methods are outlined.

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FACTORS AFFECTING THE STABILITY OF SOIL AGGREGATES.

By Roger E. Gish and G. M. Browning; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 51-53. 1948.

The authors report the results of studies on the effect of season, moisture content of the soil at sampling time, and cropping systems on size, distribution, and stability of soil aggregates of a Marshall silt loam, Belinda silt loam, and Clarion loam soils.

It was found that soil and crop management practices had a marked effect on the size, distribution, and stability of soil aggregates.

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THE USE OF SOIL TENSION COLUMNS AND A MODIFIED FORM OF THE BACK PRESSURE WELL IN STUDYING POROSITY AND DRAINAGE PROPERTIES OF TILLAGE TESTING SOILS.

By V. C. Jamison, I. F. Reed and R. W. Pearson; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 56-61. 1948.

The study reported was planned to study the effect of different tillage methods on the physical properties of the soil, to get basic information about force components involved in tillage

operations, and to make such fundamental studies as are required in the design of new tillage tools or the modification of those now used.

Pressure control apparatus and pressure plate cells used for tension studies of the soils as well as soil tension columns used in drainage studies are described. Structure as well as soil texture were factors in the drainage properties of the soils. From the data one should expect all but dispersed clays to drain to optimum plowing moisture at a tension of one atmosphere or less.

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FLOW PATTERN STUDIES IN IRRIGATED COARSE-TEXTURED SOILS.

By Howard R. Haise; Soil Sci. Soc. of Amer. Proc. Vol. 13, pp. 83-89. 1948.

A visual method was used to study directional movement of soil water in disturbed, light textured, air-dry soils representing three land classes under furrow irrigation. The wetted front in moist soils as indicated by dye movement lagged behind the wetted front as observed from tensionmetric data. This did not occur where air-dry soils were used. In general, the flow pattern in the various soil profiles were independent of soil texture differences within the range studies. It would appear from the flow pattern studies presented that fertilizer should be placed in the ridge several inches above the level of irrigation water carried in the furrow.

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FIELD MEASUREMENT OF SOIL PERMEABILITY USING AUGER HOLES.

By C. H. M. van Bavel and Don Kirkham; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 90-96. 1948.

A method, which is based on a theory advanced in a previous paper, is presented for measuring the permeability of the soil below the water table in the field. It consists of boring a hole 10 cm in diameter into the soil below the water table and observing the rate at which the water rises after the hole has been emptied by use of a small pump.

The formula used, in reducing the obtained values to the soil permeability coefficient, contains a constant A which in some cases may be derived from the theory and in others from electrical analogues. The electrical analogues are used to evaluate A from a number of cases needed in practical applications of the method. The apparatus to be used and the procedures to be followed are given in detail and a complete numerical example is presented. The example shows that the actual calculations required are elementary despite the rather complicated mathematics involved in the theory.

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THE ABSORPTION OF SULFUR DIOXIDE BY PLANTS AS SHOWN BY THE USE OF RADIOACTIVE SULFUR.

By Maurice Fried; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 135-138. 1948.

By the use of radioactive sulfur as a tracer, it was demonstrated that alfalfa plants can take in sulfur dioxide through the leaves and convert it into organic sulfur compounds. Therefore, sulfur dioxide of the atmosphere is a source of sulfur in the nutrition of the plant.

Radioautographs of alfalfa plants containing radioactive sulfur taken up from the nutrient solution showed that when alfalfa is grown at low levels of sulfur fertility, the amount of sulfur in the veins is definitely lower than the amount of sulfur in the intravenous tissue. The radioautographs also showed a higher concentration of sulfur in the younger tissues.

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CRYSTAL CHEMISTRY OF SOIL: I. THE FUNDAMENTAL STRUCTURAL GROUPS AND FAMILIES OF SILICATE MINERALS.

By M. L. Jackson, R. P. Pennington and W. Z. Mackie; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 139-145. 1948.

The fundamental structural groups and families of silicates are outlined, the main aspects of which may be summarized as follows:

1. The fundamental silica motifs, namely the unitetrahedral, duotetrahedral, cyclo-, uni-chain, duochain, layer, and framework are the basis of the silicate structural groups. Within each group, various silicate families are recognized on the basis of the coordination of the larger positive cations and the secondary motifs formed of elements other than silica.
2. Within each family, the frequency and sequence of the characteristic silica and other-than-silica motifs results in differentiation of mineral series often spoken of as isomorphous series, the crystal lattice of each being unique or invariable.
3. The sequence of categories in silicate classification are: species (first category), series, family, group, class (fifth category), and type (sixth category).

The silicates are one class of crystals, coordinate with phosphates, chlorides, etc., of other classes. The type of crystal (highest category) is based on the kind of bonding; ionic, covalent, H-bond, etc., and isodesmic, anisodesmic and mesodesmic depending on the bond strength in the most primitive motif. These categorical designations have an interesting analogy to pedologi-

cal and botanical categories.

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TYPES OF CLAY MINERALS IN ALBAMA SOILS.

By R. W. Pearson and L. E. Ensminger; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 153-156. 1948.

Mineralogical analyses were made on the clay separates of the A, B, and C horizons of 12 Alabama soils representing the Coastal Plains, Piedmont, Black Belt, Limestone Valley, and Appalachian Mountain areas. The soils from the Black Belt contained kaolinite and montmorillonite in about equal quantities in addition to small amounts of quartz and free iron oxides. Very little variation was found in mineralogical composition with depth in the profile.

The clay separates of soils from areas other than the Black Belt were principally mixtures of Kaolinite, quartz, hydrated aluminum oxide, and iron oxides. Varying but undetermined concentrations of a mineral that gave a distinct diffraction line for a 14.3 \AA spacing were observed in these clays. Since the spacing was not movable upon treatment with glycerol, it is considered to have been produced by some mineral other than montmorillonite.

The Susquehanna occupies an intermediate position, with respect to clay mineral distribution in its profile, between the kaolinitic soils and those from the Black Belt. Although the surface layer contained little montmorillonite, the amount increased sharply with depth in the profile to 65 per cent of the clay fraction in the C horizon.

Base exchange capacities reflected the predominant mineral type in the clays, but were higher in the kaolinitic soils than can be accounted for on the basis of the kaolinite content.

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THE MINERAL COMPOSITION OF THE COLLOIDAL FRACTION OF SOME SOUTHWESTERN SOILS IN RELATION TO FIELD BEHAVIOR.

By T. F. Buehrer, D. O. Robinson and J. M. Deming; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 157-165. 1948.

This paper is a report of a study made of the mineral composition of the colloidal fraction of a number of cultivated Arizona soils, some of which exhibited peculiar structural characteristics. The minerals dominantly present were montmorillonite and illite, with kaolinite and hydrous oxides in smaller proportions. The amount of montmorillonite tended to increase with depth.

Correlation of structure, water permeability,

and other soil properties with mineral content indicates that usually soils of high montmorillonite content show poor structural characteristics. Such soils have also shown poor response to gypsum reclamation. Those which in the field have given good response to reclamation treatments are those in which illite predominates in the colloidal fraction. Considerable success was had in converting montmorillonite into hydrous mica by treatment with a potassium salt, followed by alternate wetting and drying treatments.

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THE EFFECT OF SOIL ACIDIFICATION ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF THREE IRRIGATED SOILS.

By Daniel G. Aldrich, Jr.; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 191-196. 1948.

A preliminary study has been made of the effects of soil acidification on some of the physical and chemical properties of three irrigated soils. These soils are alkaline but noncalcareous and are classified as Ramona sandy loam, Hanford sand, and Yolo clay loam. Samples of the Ramona soils were taken from two series of plots that are part of a long-term fertilizer experiment. The plots of one series have been fertilized continuously since 1927 with calcium nitrate, and have been acidified (sulfured) for approximately 7 years; those of the other series have been fertilized for a similar period of time with urea, manure, phosphate, and potash, and have been acidified for approximately 17 years. The other two soils studied have received no specified treatment of N, P, or K, and have been acidified for about 4 years.

Physical measurements made on the Ramona soil show that acidification has reduced the percentage of 0.05-mm aggregates in the calcium nitrate series but has had no deleterious effect so far on aggregation in the urea series. Acidification has decreased aggregation in the Hanford soil but has had little effect on aggregation in the Yolo soil. In the acidified plots on all soils the proportion of clay particles flocculated into aggregates - 0.002 equals or is greater than that in corresponding nonacidified plots.

Evidence presented supports the hypothesis that aggregation of flocculated soil particles can be restricted under conditions unfavorable for the development of a soil microflora which can synthesize effective soil-cementing agents.

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THE BEHAVIOR OF PHOSPHORUS IN AN ALKALINE IRRIGATED SOIL IN WASHINGTON.

By C. O. Stanberry; Soil Sci. Soc. of Amer. Proc. Vol. 13, pp. 205-212. 1948.

This investigation was conducted on Sagemoor fine sandy loam. It was found that the behavior of phosphorus in this soil was quite different from that reported for acid soils. The solubility of the indigenous phosphorus compounds has not been affected appreciably by nonphosphorus fertilizers applied during 20 years. Nitrogen fertilizers stimulated increased plant growth and yields but did not increase the ability of the plant to obtain phosphorus from the indigenous phosphorus compounds of the soil.

Phosphorus applied as fertilizer was not fixed rapidly in forms unavailable to plants even though it may be immobilized.

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MOVEMENT OF NITROGEN IN FLOODED SOIL PLANTED TO RICE.

By William H. Willis and Victor E. Green, Jr.; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 229-237. 1948.

A study of the nitrogen changes that take place in flooded soil planted to rice has been conducted in the greenhouse using two soils from the Louisiana rice area.

Ammonium nitrogen accumulated in the flood water on the planted soils in quantities up to 5 ppm during the first 2 weeks of flooding. The ammonium-nitrogen content then decreased during the next 3 weeks, the time of most vigorous growth of the plants. This decrease did not occur on the unplanted soils. The presence of algae growing in the water and the applications of fertilizer to the soil had no effect on the reaction, ammonium-nitrogen, or nitrate-nitrogen content of the flood water. There were net gains in nitrogen in both soils during the growing season where the crop was present except in the Crowley soil where nitrogen had been applied.

The results of this study indicate that gains in nitrogen as a result of fixation under the conditions prevailing in rice fields during the growing season may be equivalent to or greater than the amount of nitrogen utilized by the crop. Highly significant gains in nitrogen in the absence of the crop occurred only in the acid soil where relatively large quantities of phosphorus and potassium had been applied. Heavy losses of nitrogen occurred in the soils with high nitrogen contents in the absence of the rice crop. In both planted soils increased fixation in the presence of algae occurred only in the checks. No relation was found between the ammonia content of the flood water and the gains or losses in nitrogen in the system. Changes in total-nitrogen content were not related to changes in pH of the soil or of the flood water. The immediate crop did not fully utilize the nitrogen gained by fixation and responded highly to the nitrogen applied to the soil in the ammonium form.

MICROBIAL PRODUCTS AND SOIL ORGANIC MATTER: I. SOME CHARACTERISTICS OF ORGANIC PHOSPHORUS OF MICROORGANISMS.

By W. V. Bartholomew and C. A. I. Goring; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 238-241. 1948.

Aerobacter aerogenes cells were grown in mass culture, the cells separated by centrifugation, and characterizations made of the phosphorous bearing compounds in the cell suspensions before and after decomposition and after treatment in the autoclave and with bentonite. Decomposition of the cells resulted in some break-down of all of the phosphorus bearing complexes. The ribonucleic acid, however, was dephosphorylated the least rapidly and constituted the most abundant phosphorus carrying compound in all of the decomposed cultures.

Autoclaving resulted in a fragmentation or partial breakdown of the nucleic acids and the acid soluble fraction with the result that 70.7 per cent of the total phosphorus was extractable in cold water. In the presence of bentonite more of the phosphorus was separated in the determination of nucleic acids and less in the determination of the acid and water extractable fractions than was found for the untreated cultures. Bentonite also reduced the rate of dephosphorylation and decomposition. The method of separating the phosphorus fractions can be expected to give satisfactory results with fresh viable cells. After treatment with bentonite or in the autoclave or following cell decomposition the fractionation procedure fails to make meaningful separations.

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ACCUMULATION AND MINERALIZATION OF MICROBIAL ORGANIC PHOSPHORUS IN SOIL MATERIALS.

By L. M. Thompson, C. A. Black and F. E. Clark; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 242-245. 1948.

Microbial tissue was accumulated in two soil parent materials, a calcareous, sandy-loam glacial till and an acid, clay, marine sediment, by incubating the materials with periodic additions of sucrose, ammonium nitrate, and potassium dihydrogen phosphate. Approximately 0.65 per cent organic carbon, 0.14 per cent organic nitrogen and 0.013 per cent organic phosphorus were thus accumulated in 10 weeks. Plate counts showed a great predominance of numbers of bacteria over numbers of fungi in both cases; however, the numbers of fungi were about five times as great in the acid soil material (pH 4.1) as in the calcareous soil material (pH 7.5).

The quantities of carbon, nitrogen, and phosphorus mineralized upon incubation of the samples for periods of 5, 15, 30, and 45 days at 35° C

were rather closely related in each soil, but the relative amounts of constituents mineralized differed between soils. The percentages of the total accumulated constituents that were mineralized during 45 days were, for the calcareous and acid materials, respectively; carbon - 38 and 33; nitrogen - 16 and 26; phosphorus - 46 and 22.

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AZOTOBACTER PREPARATION (AZOTOGEN) AS A FERTILIZER FOR CULTIVATED PLANTS.

By Michael I. Timonin; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 246-250. 1948.

An investigation has been made, under field conditions, of the effect of Azotogen on the yield of tobacco, oats, and potatoes. The preparation of Azotogen and the methods of its application were outlined. The experiments were conducted at four stations, at geographically different points. Climatic conditions and the soil types of each locality were different. No significant effect of inoculation with Azotogen on the yield of tobacco, oats, and potatoes was obtained.

The bacteriological analysis of the rhizosphere soil of the root system of inoculated tobacco plants revealed a good establishment of Azotobacter flora to a depth of 15 inches in the soil.

The soil investigated contained a "native" Azotobacter flora. This flora failed to establish itself in the root system of uninoculated tobacco plants.

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THE DISTRIBUTION OF AZOTOBACTER CHROOCOCCUM AND AZOTOBACTER VINELANDII IN COLORADO SOILS AND SURFACE WATERS.

By W. M. Gonick and H. W. Reuszer; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 251-257. 1948.

The possibility of detecting small numbers of *A. vinelandii* in soil in the presence of *A. chroococcum* by selective enrichment methods was studied through addition of various organic compounds to soil. The effect of 49 compounds was determined. These were added in concentrations varying from 1 to 5 per cent to a soil in which *A. chroococcum* occurred naturally and to which *A. vinelandii* was added by inoculation. The following compounds stimulated selectively the multiplication of *A. vinelandii*: cinnamic acid, calcium butyrate, and calcium benzoate with small effects shown by potassium concentration of mannitol. The species *chroococcum* was markedly favored by calcium citrate, potassium acetate, and potassium lactate and slightly favored by calcium lactate, tannic acid, glucose, fructose and galactose. For detection of *A. vinelandii* where present, it was not necessary to use sub-

stances specially favoring this species since it multiplied abundantly with many of the compounds used.

A survey was made of the azotobacter population of 283 Colorado soils. This included a search for *A. vinelandii* by enrichment methods developed in this study. The species *chroococcum* was found in 210, or 74 per cent, and *vinelandii* in only 2, or 0.7 per cent, of the soils. No azotobacter were found in 26 per cent of the soils and 83 per cent contained less than 50 cells of the organism per gram. In a few soils azotobacter were found in numbers of several thousand per gram. The organism was more widely distributed in irrigated than in dry land soils. These results do not indicate that azotobacter is of any special significance in the maintenance of nitrogen in Colorado soils.

Studies on azotobacter population were made on 29 samples of surface waters. Azotobacter was found in only one of eight samples obtained from mountain lakes and streams. In 21 samples from streams and irrigation ditches and reservoirs of the plains area *A. chroococcum* was found in 18, or 86 per cent, and *A. vinelandii* in 9, or 43 per cent, of the samples. When plated directly upon a suitable medium these waters were found to contain from none to 32 azotobacter cells per milliliter of water. The ethyl alcohol medium of Winogradsky was found best suited of those used for the demonstration of *A. vinelandii* in water. From the rather wide distribution of *A. vinelandii* in water it is apparent that this organism is added from time to time to irrigated soils in the water used for irrigation. The finding that it does not persist in these soils and that it is fairly widespread in waters, indicates that *A. vinelandii* is predominantly a water inhabiting species.

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FACTORS AFFECTING THE NITRATE PRODUCING POWER OF SOME MINNESOTA SOILS.

By A. R. Halvorson and A. C. Caldwell; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 258-260. 1948.

Some Black Prairie soils of southern Minnesota have responded markedly to applications of nitrogen fertilizers, and it has been shown that these soils have a low nitrate-producing power. Nitrification tests on the Tockton silt loam indicated that the application of nitrogen fertilizer in the field has stimulated nitrification.

Analysis of a number of soils from C, N, and pH showed that pH might have been the factor limiting nitrate production in a Floyd silt loam. The application of CaCO_3 at the rate of 4 tons per acre increased greatly the nitrate-producing power of this soil. Application of phosphate and potash had no noticeable effect. Nitrogen applied as sodium nitrate did seem to increase

nitrification. The addition of nitrogen as ammonium sulfate did not, apparently, increase nitrification of the soil organic matter, nor was all the nitrogen added as ammonium changed to nitrate at the end of 8 weeks incubation. The presence of large amounts of CaCO_3 inhibited nitrification as was shown by the results with two Webster high lime soils.

In a general way it appeared that the soil with the lower carbon nitrogen ratios had the lowest nitrate-producing capacity.

in soil organic matter.

Comparisons in the rate of decomposition of plant residues or of rates of mineral nutrient release are valid only if the soils used are similar and if the materials are added in equivalent quantities.

The data suggest that microbial activity in soils may be limited by a combination of physical and biotic factors which restrict microbial growth in proportion to the available space.

INFLUENCE OF CROP GROWTH ON MINERALIZATION OF NITROGEN IN THE SOIL.

By C. A. I. Goring and Francis E. Clark; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 261-266. 1948.

The purpose of this study was to determine the rate and extent of changes in mineralization of nitrogen in soil under a variety of crops, to compare those changes with mineralization in fallow soil, and to study concurrently the microbial population associated with the crop roots.

It is concluded that less mineral nitrogen accumulates in cropped soils than in fallow soils, even though an accounting is made of the nitrogen removed by cropping, and that the extent of the nitrogen deficit encountered is correlated to total weight of roots, to nitrogen content of crop grown, and to the increase in number of microorganisms that occurs with plant growth. It is believed that nitrogen unaccounted for in cropped soils is immobilized in the soil rather than lost to the air.

THE EFFECT OF QUANTITY OF PLANT MATERIAL ADDED TO SOIL ON ITS RATE OF DECOMPOSITION.

By F. E. Broadbent and W. V. Bartholomew; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 271-274. 1948.

The rate of decomposition of oat straw in soil was found to be inversely related to the quantity of straw added. The less rapid rate of decomposition at the higher rate of addition of straw cannot be explained on the basis of inadequate supplies of air or of deficiencies of nitrogen and phosphorus.

In the decomposition in soil of Sudan grass enriched with C^{13} the rate of decomposition of neither the added Sudan grass nor of the soil organic matter was proportional to the quantity of Sudan grass added.

Check determinations of CO_2 production do not provide a measure of the amount of decomposition

THE DECOMPOSITION OF CAREX FILIFOLIA.

By T. M. McCalla; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 284-285. 1948.

The purpose of this study was to determine the rate of decomposition of different parts of the *Carex filifolia* plant, in the presence and absence of some soil amendments, as compared with other conventional crop residues ordinarily used with a system of stubble-mulch farming.

The tops of *Carex filifolia* decayed rapidly - even more rapidly than sweet clover hay. Of the tops, roots, and crowns, the roots were more resistant to decomposition than was sweet clover or wheat straw. An estimated period of 35 to 40 years would be required to decompose completely the roots of *C. filifolia* in the field, based on the laboratory experiment where conditions with respect to temperature and moisture were favorable during the decomposition period.

The addition of KNO_3 , HN_4NO_3 , and K_2HPO_4 singly and in combination increased decomposition of the *C. filifolia* roots only slightly. These amendments did not increase the decomposition of the tops. Ammonium nitrate singly, and KNO_3 and K_2HPO_4 together, increased decomposition of the crowns slightly. Potassium nitrate alone increased decomposition from 34.4 per cent to 48.5 per cent, whereas the phosphate alone caused a reduction of decomposition.

SOIL AGGREGATION AS INFLUENCED BY THE GROWTH OF MOLD SPECIES, KIND OF SOIL, AND ORGANIC MATTER.

By C. M. Gilmour, O. N. Allen, and E. Truog; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 292-296. 1948.

The purpose of this study was to investigate the influence of particle size and distribution and type of organic matter on the formation of aggregates by certain mold species.

The role of nine mold species in the aggregation of three diverse soils, relatively low in organic matter content, was determined in the

presence and absence of ground oat straw or alfalfa. Inorganic nutrients were added in all cases. The level of aggregation obtained in each soil was expressed as the percentage of unbound silt and clay remaining after an incubation period of 30 days at 28° to 30° C. Measurements were made by sampling suspensions in accordance with the usual pipette procedure followed by photo-electric turbidity readings. It was concluded that: Inoculated soils to which neither oat straw nor alfalfa was added underwent only a slight to moderate degree of aggregation; the addition of oat straw and especially alfalfa in the presence of the molds decreased the percentages of unbound silt and clay in the three soils studies. Lesser decreases in the unbound fraction were obtained in the absence of the mold species; the susceptibilities of the soils to erosion were reduced in the presence of alfalfa and the various mold species; mold effectiveness in the aggregation process was found to be related to the effectiveness of the individual mold species, the type of organic matter, and the physical composition of the soil.

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YIELD AND PROTEIN CONTENT OF PASTURE HERBAGE AS INFLUENCED BY NITROGEN FERTILIZATION AND FREQUENCY OF CLIPPING.

By Robert A. McCreery and Matthias Stelly; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 307-310. 1948.

A series of five mixtures of grasses and legumes commonly found in the permanent pastures in the Piedmont Section of Georgia was studied on a representative area of Cecil sandy loam at Whitehall, Georgia. The area planted to each botanical mixture was divided into four equal parts, one quarter receiving nitrogen at each rate; i.e. 0, 20, 40, and 60 pounds of nitrogen per acre. The area assigned to each rate of nitrogen was further divided into quarters for clipping intervals. Clippings were at intervals of 1, 2, 3, and 4 weeks. All treatments were replicated three times.

Statistical analysis of the air-dry yield data shows no significant differences for mixtures of grasses and legumes used at any period of the experiment. Differences in yield attributable to nitrogen fertilization were highly significant (1 per cent level) for the first 4 weeks of the investigations, but showed no significance during the 4- to 8- or 8- to 12-week periods. Significance for clipping interval remains highly significant (1 per cent level) throughout the period studied.

Statistical analysis of the protein content data shows significance for clipping interval at all three periods that chemical analyses were made. The shorter clipping intervals resulted in a higher protein content. This significance in-

creases with time. The only mixture which shows significant (5 per cent level) increases in protein content is the one containing both legumes and during the 4- to 8-week period. There are no other significant differences in protein content due to mixtures.

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THE EFFECT OF TILLAGE PRACTICES ON THE NUTRIENT CONTENT AND YIELD OF CORN.

By Kirk Lawton and G. M. Browning; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 311-317. 1948.

The authors report the growth of corn and the nitrogen and potash content of the plant when sampled in August 1945 on fields of Carrington, Fayette, Tama, Marshall, Clarion, and Webster soils. The yields of corn and the amount of exchangeable potash in the soil is also reported for some of the fields.

In general the soils with favorable soil structure well supplied with nutrients showed little or no symptoms of nutrient deficiency and the differences in yields of corn were not large regardless of the tillage practices. However, soils with less favorable physical condition and soils which frequently are deficient in nutrient elements gave the highest yields with those tillage practices which gave the greatest aeration of the soil. Furthermore, on the less well drained soils the corn is frequently damaged more under the tillage practices where plantings are made in a furrow.

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MICROBIOLOGICAL ASSAYS OF HAYS FOR THEIR AMINO ACIDS ACCORDING TO SOIL TYPES AND TREATMENTS INCLUDING TRACE ELEMENTS.

By Wm. G. Blue, Victor L. Sheldon, and Wm. A. Albrecht; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 318-322. 1948.

The vegetative plant parts were microbiologically assayed for their contents of nine amino acids in order to correlate, if possible, the concentration of these with the soil treatments, particularly some trace elements.

The percentages of the essential amino acids contained in the lespedeza hays varied as a result of differences in the soil type and of differences in the soil fertility of any type as a result of soil treatment. The increased concentration of the amino acids in the crop does not necessarily mean that a large share of the crop's total nitrogen is in the amino acid form. While soil treatments are giving higher concentrations of the amino acids there may also be an increase in the total nitrogen in the forage resulting from soil treatment. Variations in the concentration of the amino acids present in the alfalfa

were shown to be due to manganese, boron, phosphorus, and potassium but the minor elements manganese and boron gave the greatest increase without appreciably altering the total nitrogen.

It seems possible to improve the quality as well as the quantity of the protein produced per acre by the relatively small application and wise choice of inorganic nutrients applied to the soil. The uniformity and balance of the inorganic constituents reflect themselves more in providing a relative uniformity in the amino acids than in increasing any of the individual amino acids. The extremely complex nature of the soil-plant relationship renders untenable the belief in any simple evaluation of forages and other feeds by means of ordinary chemical ash analysis, and suggests that this whole subject of soil fertility in relation to both photosynthesis and biosynthesis by the crop demands further study if nutritious foods are to be continuously produced.

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CROP RESPONSE TO POTASH ON OREGON SOILS.

By W. L. Powers and L. A. Alban; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 342-346. 1948.

Some sandy or peaty soils, and some old grain land with compact subsoils have been found to need potash. Included are numerous leached soils of western Oregon and a few of eastern Oregon. Soils with less than 400 pounds per acre may respond, and those with less than 200 pounds per acre frequently will respond to potash applications. Tentative values for potassium content needed in normal young plant leaves at the blooming stage are given for several kinds of indicator plants. Scorched leaves were lower in potash. Potash fertilizer where needed has increased crop yield, available soil potash, and leaf potash, and has improved the quality of certain crops.

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RELEASE OF NONEXCHANGEABLE POTASSIUM AS INFLUENCED BY WEATHERING, SOIL MINERAL TYPE, SOIL REACTION, AND POTASSIUM FERTILIZATION.

By C. Dale Hoover, U. S. Jones, and L. E. Gholston; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 347-351. 1948.

The influence of weathering, soil reaction, soil mineral type, and potassium fertilizers on the release of nonexchangeable potassium was investigated. Nonexchangeable potassium was determined by subtracting the decrease in exchangeable potassium brought about by cropping for 545 days from the total amount of potassium removed by the millet crops.

The influence of weathering on this release was

measured by cropping the top soil and subsoil of a virgin Ruston sandy loam continuously in the greenhouse for 545 days and determining the nonexchangeable potassium released. The nonexchangeable potassium in the weathered virgin top soil was more readily and quickly available to the millet than was that in the less weathered subsoil.

Grenada silt loam and Savannah fine sandy loam differed in their clay mineral type and in their potassium supplying power to cotton in the field. These soils were subjected to continuous cropping and the nonexchangeable potassium release determined. The Grenada soil released 376 pounds of nonexchangeable potassium and the Savannah fine sandy loam released 125 pounds. Chemical characterization of the clay revealed that Grenada silt loam contained a significant supply of potassium-bearing minerals of the 2:1 type, and the clay of the Savannah fine sandy loam had a smaller amount of potassium-bearing minerals and was predominantly of the 1:1 type. This indicated that the type of secondary minerals in these two soils was responsible at least in part for the difference in the amount of nonexchangeable potassium released.

In order to determine the influence of soil reaction on the release of nonexchangeable potassium, samples of Grenada silt loam from a field liming test which had pH values of 5.7, 6.2, 6.6 and 7.2 were subjected to continuous cropping and nonexchangeable potassium determined. The data indicated that soils which had been limed to pH 6.6 and 7.2 released a little more nonexchangeable potassium than did ones of pH 5.7 or 6.2.

In order to determine if nonexchangeable potassium might accumulate in a Grenada silt loam, samples of this soil which had been fertilized with none, 24, and 48 pounds of K_2O annually for a period of 19 years were subjected to successive cropping with millet and nonexchangeable potassium release calculated. The data indicated that much of the potassium which was added to the soil in excess of that which was held in exchangeable form was accumulated as nonexchangeable potassium and held in reserve until it was needed for plant growth.

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RESPONSE OF COTTON TO LIME ON GEORGIA SOILS.

By L. C. Olson; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 388-390. 1948.

The value of light broadcast applications of ground limestone for cotton fertilized with nonacid forming fertilizer has been pointed out. Soil pH is not a reliable criterion to determine when liming is necessary when the reaction falls in the range studied, pH 5.5 to pH 6.3. However, under more extreme conditions of acidity or

alkalinity it is to be expected that Ph values could be successfully used for this purpose. Exchangeable calcium appears to be a somewhat more reliable method for determining the lime needs of soils. With soils of low base-exchange capacity such as those studied, a high degree of saturation with calcium representing a pH of 6.5 or above, is needed to supply adequately the needs of cotton for calcium.

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THE INFLUENCE OF FORM AND FINENESS OF LIME COMPOUNDS UPON THE CORRECTION OF ACIDITY AND UPON THE NUTRIENT STATUS OF SOIL.

By R. L. Beacher and F. G. Merkle; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 391-393. 1948.

The neutralizing values of ground limestones and hydrated lime were determined by their reaction with 0.3 N acetic acid having a pH value of 2.6 acting over 15 and 30 minute intervals.

For calcitic limestones the 200-mesh material is nearly as effective as the corresponding hydrate. The 100-200 mesh material is definitely slower. Material coarser than 20-mesh is less than one third as effective as hydrate in neutralizing this weak acid.

The neutralizing value in 0.3 N acetic acid agreed quite closely with the activity of calcitic limestones of varying degrees of fineness in influencing availability of soil nutrient elements. This was revealed by their effect in decreasing the replaceable H, Al, and Mn and in increasing the Ca, Mg, PO_4 , and pH.

Dolomitic limestones are slower to act biologically and chemically but the chemical measurement of their relative effectiveness does not agree with the response in soil.

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THE EFFECT OF LIGHT, SOIL TEMPERATURE, AND SOIL MOISTURE ON HIGH-LIME CHLOROSIS.

By L. M. Burtch, D. W. Thorne, and F. B. Wann; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 394-398. 1948.

The effect of climatic conditions on high-lime chlorosis is an aspect of the problem which has received little attention. The investigation was designed to study the importance of the factors of light, soil temperature, and soil moisture on a lime-induced chlorosis.

Bean plants were grown in a high-lime soil placed in 15-inch-deep pots. The pots were suspended in water baths at various constant temperatures ranging from 15 to 35° C. Light variations used included: full summer sunlight through red and blue plastics of known light transmission

values, normal winter day in the greenhouse, and normal winter day in the greenhouse plus 7 hours of artificial illumination. Moisture levels were controlled through the use of tensiometers and Bouyoucos blocks. Moisture variations included irrigation at maximum soil tensions of 100, 250, 600-700 centimeters of water, and near the wilting point. Records were made of the degree of chlorosis of plants at regular intervals. The yield of plants and their mineral content were determined.

The results indicate that a high-moisture level together with low soil temperatures is the condition most conducive to the development of high-lime chlorosis. Neither quality, intensity, nor duration of light seem of major importance in the occurrence of the disease. The order of importance of the individual climatic factors in inducing the disease appears to be: (1) high soil moisture level, (2) low soil temperature, (3) high soil temperature, (4) high light intensity.

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INDIANA RESULTS WITH LIME AND FERTILIZERS ON PERMANENT PASTURES.

By Jerome P. Seaton and Gerald O. Mott; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 402-412. 1948.

Limestone and fertilizers applied to three permanent pastures in Indiana have produced variable results in production of dry matter and protein during 8 years. Important conclusions resulting from this work are: Consistent increases in dry matter, protein, and percentage of legumes have resulted from applications of 200 to 800 pounds of superphosphate per acre every 2 years. Two tons of limestone have increased dry matter, protein, and percentage of legumes at Lafayette on the Crosby silt loam and at Springville on the Frederick silt loam. Two tons of limestone depressed yields of dry matter and protein on the Gibson silt loam, which had been previously limed, at Putnamville. Profitable responses to lime and fertilizers over a period of years may result from good responses in only some of those years. Potash increased yields of dry matter on the Crosby and Gibson silt loams, both deficient in available potash, but had little effect on the Frederick silt loam which was not deficient in available potash. Nitrogen as ammonium sulfate increased dry matter on the Crosby and Gibson silt loams but not on the Frederick silt loam. Nitrogen increased protein only on the Gibson silt loam. Lime raised the pH of only the upper 2 inches in the Crosby and Frederick silt loams in 5 years. Very little available phosphorus penetrated farther than 2 inches in 5 years on any of the three soils.

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SOME EFFECTS OF CRUDE PETROLEUM ON SOIL FERTILITY.

By M. J. Plice; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 413-416. 1948.

It is well known, in petroleum-producing regions, that crude oil can "sterilize" soils and prevent crop growth for various periods of time. The duration of the damaging effect depends largely on the degree and depth to which the soil is saturated with the oil. The damage that oil does is due mostly to the prevention of the plant from obtaining sufficient moisture and air and from ramifying its roots; very little is due to toxicity, as such. Oil-damaged soils are best reclaimed by cultivation, after the petroleum has "hardened" to the extent that the soil will scour a plow share. Depending on depth of saturation and climatic conditions this might be anywhere from 1 or 2 to several years following contamination. Crude petroleum is converted to soil organic matter by bacteria and fungi. During the conversion the organisms, which are free livers, fix fairly large amounts of atmospheric nitrogen in their substance. Later, this nitrogen becomes available for plant growth and the organic matter improves soil physical conditions.

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THE INFLUENCE OF TREATMENT ON FERTILITY LEVEL AND CROP RESPONSE OF MARYLAND SOILS.

By R. P. Thomas and H. B. Winant; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 417-422. 1948.

The authors made a check on some of the usual fertility practices on Maryland farms for the purpose of arriving at a sounder basis for making lime and fertilizer recommendations. Several farms in the State were selected and practices of these farmers and the fertility levels of their soils obtained from laboratory studies were recorded. This paper is a partial report of both the field and laboratory observations.

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PHOSPHORUS FERTILITY AND MOVEMENT STUDIES ON NEWLY RECLAIMED SANDY SOILS.

By Charles D. Converse; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 423-427. 1948.

This study was conducted for the purpose of determining the amounts of phosphorus that would be most economical on newly reclaimed sandy soils and whether it might be applied as liquid phosphoric acid in the irrigation water, or whether the more expensively applied solid sources would have to be used.

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SOIL ZONES OF THE GREAT PLAINS STATES - KANSAS TO CANADA.

By James Thorp, B. H. Williams, and W. I. Watkins; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 438-445. 1948.

The soil zones of the Great Plains are aligned in a general north and south direction corresponding to climatic belts. Prairie soils lie in the eastern-most part where Thornthwaite classifies the climate as moist-subhumid. The Chernozem soils, and some of the Chestnut soils, lie within Thornthwaite's belt of dry-subhumid climate, the western part of which follows the western boundary of Chestnut soils in some places and lies considerably farther east in other places. Generally, the drier part of the Chestnut soils zone is within the eastern edge of Thornthwaite's semiarid climatic belt. Thornthwaite's semiarid belt embraces all of the zone of Brown soils, and in addition, a small area of Sierozem soils in southeastern Colorado. Along the foothills of the Rocky Mountains the westward trend toward aridity is reversed. The semiarid parts of the Great Plains Grade first into dry-subhumid areas just east of the mountains, then rapidly through a moist-subhumid zone into humid climates in the mountains. Corresponding reversals in vegetation types and soils, from one end of the Rocky Mountains to the other, exemplify the phenomena commonly called vertical zonation. A similar reversal of soil and vegetation zones may be seen around and into the Black Hills, and the smaller isolated mountains of central Montana.

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SOIL DEVELOPMENT IN THE ROCKY MOUNTAINS.

By John L. Retzer; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 446-448. 1948.

Mountain areas are often thought of as rough, steep lands with shallow, stony soils. However, with the exception of bare rock areas, the Rocky Mountains are mantled with a variety of soils ranging from very immature to very mature. The profiles of these soils may be stony or free of stones; often shallow, some are exceptionally deep; some are porous and droughty, while others have thick, dense subsoils and may be poorly drained.

The mountains provide an excellent opportunity to study and evaluate the relative influence of each of the factors of soil formation. Widely different profiles and soil areas are often so located and the circumstances are such that their differences can be specifically attributed to a variation in one of the five soil-forming factors. An exceptionally wide range of conditions can be studied in a relatively small area. Many areas are virgin or pristine, an obvious advantage. Like soils that have developed everywhere, soils of the Rocky Mountains reflect the

variations and conditions of their environment.

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THE CHARACTERIZATION OF SLOPE POSITIONS AND THEIR INFLUENCE ON THE TOTAL NITROGEN CONTENT OF A FEW VIRGIN SOILS OF WESTERN IOWA.

By Andrew R. Aandahl; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 449-454. 1948.

During the period from 1936 to 1942, inclusive, more than 2,000 sample corn yields were harvested from Tama, Marshall, Fayette, and Grundy soils in Iowa. The effects on corn yields of A horizon depth and slope gradient were given primary consideration. Variations of A horizon depth and organic matter content within a soil series may result from many causal factors. One of these is the differences which existed in the original depths of the A horizon. During the analysis of the corn yield data it soon became apparent that the corn yield differences were caused by several factors in addition to erosion. In order to obtain some measurement of this original variability of the A horizon a study of a virgin area was made. Samples of several virgin soil profiles were collected and studied. These virgin soil profiles vary in part because they have different plant microclimates which are related to topography. Geological erosion was also a factor.

The principal objective of the study was to obtain some measure of the thickness and organic matter content of the A horizon associated with different slope positions. It was believed that the A horizon varied not only in depth, but also in quality, quality being measured by organic matter or nitrogen content.

A simple inspection of the data indicates clearly that there are big differences both in the total nitrogen of the profiles and in the per cent nitrogen of any given horizon. Many of these differences could be recognized in the field by the color of the soil. The nitrogen contents of all profiles collected near the tops of the ridges were low compared to those on the low slopes. An examination of the data with regard to the influence of the length of slope on the average per cent nitrogen indicates that there may be a rather close relationship. A thinner soil is normally formed on steeper slopes but the other slope characteristics often upset this relationship.

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CHEMICAL AND PHYSICAL CHARACTERISTICS OF BOWDOIN CLAY FROM THE MILK RIVER VALLEY OF MONTANA.

By Elmer E. Frahm; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 455-460. 1948.

An area of Bowdoin clay was sampled at three

sites. Samples were taken to a depth of 18 inches in three increments, 0 to 8 inches, 8 to 12 inches and 12 to 18 inches.

Moisture retention characteristics and laboratory permeability rates were determined. Saturation extracts were analyzed for cations and anions and pressure membrane extracts for sodium. Cation exchange capacity was measured. Saturation, one-third atmosphere, and 15-atmosphere moisture percentages were high, generally following values in the range 100:50:25 respectively for most of the samples. Permeability to water was low for each sampling site, but calcium containing amendments appeared to correct this deficiency in laboratory tests. Saturation extracts for five of the nine samplings were quite saline. Sodium and sulfate were the ions in excess. Exchangeable sodium percentages were above 15 per cent for all samples except one. All the soils were classified as saline-alkali.

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THE COMPOSITION OF THE SILT FRACTION AS RELATED TO THE DEVELOPMENT OF SOILS FROM LOESS.

By M. Elsworth Springer; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 461-467. 1948.

These studies point out that the silt fractions in the surface horizon of the Hamburg, the soil nearest the source of the loess, were similar to those at greater depth. Little weathering has therefore taken place and development of this soil has made little progress. For the other soil types, representing increasing distance from the source of the loess, the silt fractions of their A horizons showed weathering by increased quartz/calcium ratios and by increased potassium calcium ratios. However, the silt fractions at the lower depths, representing the loessial parent materials, were of similar composition in all these soil types and correspond to those of the Hamburg profile. In the light of these facts it seems reasonable to believe that the Hamburg is roughly, a loessial deposit corresponding, except in texture, to the parent materials from which the other soil types were developed. Although the carbonates were leached from the loess at distances greater than 4 miles from the bluff, there was no great change in its silt fractions. The loess from which all of these soils were developed must have been deposited under conditions preventing significant weathering, even of the readily weatherable calcium-bearing minerals.

The Hamburg soil has undergone little development and shows many of the properties of the original loess. The other soils have progressed further in their development and have acquired distinct characteristics. With Hamburg excepted, they are all similar in pH of the surface soil, degree of textural differentiation, and chemical composition of the silt. They differ from each

other in texture throughout the solum as well as in texture and depth of their underlying loess. Other differences are color, organic matter content, structure, and depth to carbonates. Thus it seems that properties such as organic matter content, color, structure, and depth to carbonates may vary even when silt composition is constant.

These soils are in the early stages of soil development where the weathering of the silt particles from a rich mineral reserve is still replenishing the supply of cations on the soil colloidal complex. With time the calcium, sodium, and potassium-bearing minerals, along with other non-quartz minerals, are weathered and the mineral reserve becomes poorer. Under those conditions the lack of mineral reserve becomes a limiting factor which affects other properties of the soil and in turn the desirability of the soil for crop growth.

COMPOSITION OF ALLUVIAL DEPOSITS VIEWED AS PROBABLE SOURCE OF LOESS.

By Alvin H. Beavers and Wm. A. Albrecht; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 468-470. 1948.

That the alluvial deposits on the flood plains of the Missouri-Mississippi rivers between Rockport, Mo., and Vicksburg, Miss., are highly similar in mineral and chemical composition is pointed out by the studies of the silica, quartz, phosphorus, potassium, and pH of the alluvium.

As a collector, mixer, and depositor of the material which it carries, according to the evidence here, the Missouri-Mississippi river system is bringing about uniformity of its sediment throughout its course. Therefore, the barren river flood plain, swept by winds that pick up certain separates of the sediments and re-deposit them on the upland would make such deposits, of necessity, consist of material that is relatively constant in mineral and chemical makeup.

According to these data, then, the relative mineral and chemical uniformity of loess over wide areas is not due to any specific part played by the wind. Rather, it seems plausibly explainable as the result of the action of a river, in bringing about uniformity of its sediments left in its flood plains to be picked up by the winds and deposited as loess. Soils developed from loess, then, would vary according to the climatic factors operating in any specific location.

OBSERVATIONS ON HYDROLOGIC SEQUENCES IN SOILS OF AMERICA AND JAPAN.

By T. M. Bushnell; Soil Sci. Soc. of Amer. Proc.,

Vol. 13, pp. 481-483. 1948. This discussion is essentially a continuation of a series of papers in which the term "taxonomic catena" was used instead of "hydrologic sequence". This paper reports instances of pedological studies or observations of landscapes which seem to show how the suggested extrapolation of the principles of the midwestern key may "work out" elsewhere.

CORRELATIVE STUDIES OF INDIANA SOILS: I. SOME PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEVEN MAJOR SOIL TYPES.

By Roy A. Weaver, T. M. Bushnell, and George D. Scarseth; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 484-493. 1948.

This study of certain Indiana soils was approached from two viewpoints, namely (1) that of soil physics and chemistry, with the objective of contributing data on fundamental characteristics of soils of the world; and (2) that the Indiana soil classification, as correlative laboratory work to establish characteristics which would help in broad interpretations and answer some detailed questions about groupings or separations.

The need for more information on the basic characteristics of major soil types prevails. It was to this end that the current work was undertaken in 1938, mostly as a supplement to other research that was conducted on formal projects.

SOME CHARACTERISTICS OF SALINE AND ALKALI SOILS IN GEM COUNTY, IDAHO.

By Milton Fireman and R. C. Reeve; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 494-498. 1948.

These investigations were conducted for the purpose of determining proper criteria for alkali appraisal; namely, selection of tests and methods which could be used as a basis for mapping alkali soils.

RATING SOILS FOR TIMBER SITES.

By R. Earl Storie and A. E. Wieslander; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 499-509. 1948.

A field study was started in 1948 on the relationship of soils, climate, and timber site quality. This paper reports on studies at 163 field locations extending from the Pacific Ocean to the east side of the Sierra Nevada mountains in Nevada. The soils were studied at each location, then classified, and the timber site-quality determined by referencing the height and age value to appropriate site class curves.

Four main soil factors appear to govern or limit the growth of conifers in California. There are (a) soil depth and texture characteristics; (b) soil permeability; (c) soil chemical characteristics; (d) drainage and runoff properties. In addition there is the climatic factor.

High sites for growing conifers in California need a deep soil of sufficiently fine texture to hold about 12 per cent or more of moisture; a permeable profile; have no toxic chemical characteristics; be of acid reaction; well drained; and have a total annual rainfall of more than 40 inches.

A preliminary timber rating chart is presented, based on assigning percentage ratings to five factors: (a) soil depth and texture; (b) soil permeability; (c) soil chemical characteristics; (d) drainage and runoff properties; (e) climate.

Four climatic zones are considered in rating the timber sites in the Sierra Nevada and Coast Range Mountains of California and Nevada.

A SITE CLASSIFICATION FOR EASTERN RED CEDAR IN THE OZARKS.

By John L. Arend and Robert F. Collins; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 510-511. 1948.

Site conditions on which natural stands of eastern red cedar in the Ozarks were found vary from deep alluvial soils to very shallow upland soils less than 12 inches in depth. Depth of the soil was the principal site factor measured that affects the growth and character of natural stands of eastern red cedar on upland soils. Soil acidity within the pH range of 4.7 to 7.8 has little effect on the growth and distribution of natural stands of eastern red cedar in this region.

THE COLLECTION AND STUDY OF NATURAL SOIL CORES FOR DETERMINING IRRIGATION PROPERTIES.

By Albert W. Marsh and L. R. Swarner; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 515-518. 1948.

Natural soil cores were cut from certain problem soils on the Owyhee Irrigation Project in eastern Oregon. These cores were wrapped in aluminum casings and transported to the laboratory. After some preparation, including the insertion of manometers, the cores were placed in a rack. Percolation trials were run to determine the permeability and the relative resistance of the various portions of the profile. Some results are reported showing the varying permeability between individual cores and between soil groups. The least resistance to water penetration tended to be at or near the surface, the greatest re-

sistance in the subsoil just above the compact section. These cores are useful also for obtaining soil samples by horizons necessary for the determinations of volume weight, moisture-tension curves, salinity, exchangeable bases, mechanical analysis, and 15-atmosphere moisture percentage. Certain advantages and disadvantages of the aluminum casings are pointed out. A suggestion is made that the disadvantages could be overcome by the use of transparent plastic containers for laboratory permeability measurements.

THE EFFECTS OF SOIL AMENDMENTS ON SOIL AGGREGATION AND ON WATER MOVEMENT.

By D. S. Hubbell and Thomas M. Stubblefield; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 519-522. 1948.

Field and laboratory investigations on the effects of soil amendments on soil structure and water movement were carried out on Gila clay and Gila loam. Six chemicals and an activated sludge were applied to the soils in the laboratory. The chemicals used were: calcium sulfate, calcium nitrate, calcium oxide, calcium carbonate, ammonium sulfate, and sulfuric acid. Field soils received applications of sulfuric acid, sulfur and gypsum.

The addition of soil amendments, regardless of quantity or kind, had no significant effect on the formation of water-stable aggregates in either the field or the laboratory soils.

In unincubated samples, percolation rate was accelerated by all amendments except calcium carbonate; whereas in incubated samples, only calcium nitrate, sulfuric acid, and Alconite raised the percolation rate. Differences were highly significant where sulfuric acid was used. In general, the treated soils tended to increase in total soluble salts. Soil pH values were unaffected except in the presence of calcium oxide and sulfuric acid.

General observations and previous work showed that in the field all soil amendments tended to increase water penetration. Laboratory analyses showed that, where sulfuric acid was used as an amendment, total soluble salts increased slightly and pH values tended to remain unchanged. In the presence of gypsum or sulfur, pH values dropped slightly and total soluble salts showed little or no change.

THE QUALITY OF IRRIGATION WATER AND SOIL PERMEABILITY.

By L. D. Doneen; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 523-526. 1948.

The data presented are concerned primarily with land considered good agriculturally and containing no excess salts, but where the infiltration rate of the soil is impaired by the use of a high Na percentage water. Preliminary results indicate that direct application of gypsum to the soil is not entirely satisfactory. While being effective in increasing penetration of water for the first few irrigations early in the season, the gypsum will leach from the periphery of the furrow and the high per cent Na water will again cause this soil to seal and prevent deep percolation. This is particularly applicable to such crops as are irrigated from 20 to 30 times per season.

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SALT DISTRIBUTION UNDER FURROW AND BASIN IRRIGATED COTTON AND ITS EFFECT ON WATER REMOVAL.

By C. H. Wadleigh and M. Fireman; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 527-530. 1948.

The purpose of this study was to ascertain the degree of variability which may occur in salt distribution within artificially salinized field plots. Three qualities of irrigation water were used and two distinct irrigation regimes were followed.

This study has emphasized the need for detailed sampling and consideration of the moisture as well as the salt content of the soil in order to get a valid appraisal of the saline stress that the plant is actually integrating. It is possible to secure soil samples containing a high percentage of soluble salts under plants making good growth, but it is most probable that the salinity status of such a sample would be quite irrelevant to plant performance. On the other hand, it is possible to secure a soil sample which is non-saline under plants actually suffering from salinity because of complete moisture depletion in the non-saline pocket of soil which was sampled.

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EARTH LININGS FOR IRRIGATION CANALS AND RESERVOIRS.

By C. W. Lauritzen and O. W. Israelsen; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 531-538. 1948.

This study was conducted for the purpose of obtaining more information relative to the properties of earth materials that govern their use and value for lining and the construction principles best suited to their use.

The essential requirements of a lining material is that it possess a low order of permeability. Permeability is not a fixed property with earth as it is with some other materials but varies

widely with the arrangement of the structural units and the state of compaction. The permeability of most earth materials, finer textured than a sandy loam and normally relatively permeable, can be reduced to a low value by compaction at optimum moisture. There are some soil and bentonite materials, however, which are relatively impermeable to water in the uncompacted state. In general, soil materials should be used without dilution for lining, while bentonite makes a superior lining when mixed with soil. Bentonite mixed with sandy loam at the rate of one part to ten parts of soil material was found to have as low a permeability and to be more stable than bentonite alone. No single property such as texture, clay content, degree of dispersion, swelling ratio, or gel volume was found to be a good index of permeability. True, materials with a swelling ratio > 1.5 and a gel volume > 40 per cent invariably exhibited low permeabilities but this eliminated most other materials other than the high-swelling bentonites of fair purity. This is not justified as the permeabilities of certain soils are sufficiently low to qualify them as lining materials. A direct permeability measurement on a column of material placed in the permeameter in an air dried state and settled by jarring appears to be the best basis of selecting lining materials. Materials exhibiting a permeability of 0.1 foot per year or less normally can be considered satisfactory.

A second consideration in the selection of a lining material is its relative stability or resistance to erosion. All earth linings tested were eroded at velocities of 1.5 fps and destructively eroded in the vicinity of the water surface by wave action alone, the velocities in the channel being < 0.25 fps. Based on this observation it is concluded that all earth linings must be protected with a non-erosive covering if they are to be serviceable. In low-velocity channels and reservoirs the protective covering can probably be restricted to the side slope and the vertical distance through which the water level fluctuates. Since all linings must be covered, the permissible velocity will be governed by the type of covering used.

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SOME PROPERTIES OF SOILS ASSOCIATED WITH PIPING IN SOUTHERN ARIZONA.

By Joel E. Fletcher and Paul H. Carroll; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 545-547. 1948.

The authors attempted to evaluate the piping process and formulate and effect a cure for it. "Piping" denotes that type of erosion whereby subsoils erode out from under the surface in rounded channels, thus resulting in the final caving-in of the surface soil. The study was conducted on four areas in southern Arizona

which are subject to piping. The study consisted of two parts, namely, a series of detailed field observations of profile characteristics, permeability, and conformation of the pipes, and a laboratory examination of samples of soil from the various areas.

There appears to be two conditions necessary for piping. First, water must have access to the subsoil at a greater rate than the substratum can absorb it. Second, there must be a ready outlet for the resultant lateral flow of the water. The piping can be prevented by cutting the water off, either at the inlet or at the outlet.

SOIL MOISTURE VARIATIONS AS INFLUENCED BY VEGETATION.

By J. H. Axley and R. P. Thomas; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 548-550. 1948.

The average soil moisture during the summer growing season was lowest under pasture vegetation and became successively higher for grain and grass seeding, hay, corn, and woods.

Runoff decreased slightly the soil moisture in August and September when up and down the slope tillage of corn was practiced in contrast to contour tillage. In no other case did tillage methods, pasture furrows, or strip cropping increase soil moisture levels. Woods vegetation, under conditions of this experiment, has its water requirement well satisfied by rainfall entering the soil, whereas pasture vegetation was usually not satisfied.

Soil moisture was reduced as the vegetation cover decreased from woods pasture. Indications are that evaporation under these accelerated conditions became the controlling factor in determining soil moisture.

It is believed that the effect on evaporation produced by the protective cover given soils by vegetation is one of the most important factors controlling soil moisture.

RESIDUAL EFFECTS OF ORGANIC MATTER ADDITIONS ON RUNOFF, SOIL LOSS AND CROP YIELD.

By O. R. Neal, G. D. Brill and S. J. Richards; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 551-553. 1948.

During a 4-year period ending with 1941, treatments on run-off plots consisted of 20 tons of manure annually, a winter cover crop of rye annually, a combination of the manure and cover crop, and check areas without conservation treatment. All areas were cultivated in vegetable production and fertilized uniformly in accord-

ance with recommendations for the crops grown. During the period of annual application, each of the treatments reduced soil and water losses markedly in comparison with the check. The combined cover and manure treatment was more effective than either treatment alone.

The treatments were stopped in 1942. Since that time a crop rotation study has been operated on these plots. The rotations are distributed symmetrically over the previous treatments. Thus by combining results from the rotations on the basis of earlier treatment, information on residual effects of the earlier treatments can be obtained.

During a 6-year period following the manure, cover crop, and cover plus manure treatments, yields of tomatoes and sweet corn have been available for a study of residual effects of the treatments on crop growth. Average yields from quadruplicate plots for the entire period have been higher for either manure or cover crop than from the check areas. The effect from each of these treatments tended to be additive as indicated by the yield from the cover plus manure treatment. Yield from the latter areas exceeded that from either treatment alone and was considerably higher than that from the check areas.

Water losses as run-off have been consistently lower from the manure treatment than from the check, and from the cover plus manure as compared with cover crop treatment alone. Soil losses, while more variable, have followed the same general trend as run-off. The extent of reduction in soil and water losses by these treatments during the study of residual effects has been much less than that during the period of annual application. Residual conservation benefits, however, continued in effect at the end of the sixth year following the cessation of treatments.

SWEETCLOVER IN A STUBBLE-MULCH SYSTEM.

By F. L. Duley and J. C. Russel; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 554-557. 1948.

The authors present procedures which have been evolved for using biennial sweetclover in a stubble-mulch system, and give experiences and data that illustrate the advantages and importance of this or some other legume in the practice of conservation farming.

PARTRIDGE PEA IN A STUBBLE-MULCH SYSTEM.

By T. H. Goodding, F. L. Duley and J. C. Russel; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 558-560. 1948.

Partridge pea has certain favorable character-

istics as compared with other annual legumes. It grows well when seeded as a companion crop with small grain, and grows rapidly after the grain is harvested and produces seed. The plants remain erect over winter and may catch snow. In the following spring the plants volunteer profusely, but germination is late. It may serve as a desirable leguminous weed in small grain, but give no trouble when the land is in row crops.

Experience with it on sandy soils in Nebraska, which covers only 2 years, has been encouraging. It has grown under soil conditions where annual and biennial sweetclover have not done well, and stands have been obtained where other legumes succumbed to dry weather.

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PRELIMINARY HYDROLOGIC RESULTS, 1935-48, "BASE ROCK" UNDISTURBED SOIL LYSIMETERS IN THE GRASSLAND TYPE, ARIZONA.

By W. P. Martin and L. R. Rich; Soil Sci. Soc. of Amer. Proc., Vol. 13, pp. 561-567. 1948.

The Base Rock lysimeters of the Sierra Ancha Experimental Forest located on the Salt River watershed in Arizona are described. The lysimeters are one-fiftieth of an acre in size, contain undisturbed clay soil of the reddish chestnut group 3 to 6 feet deep overlying impervious quartzite bedrock, have a southeast slope of 20 per cent, and are located at an elevation of 5,000 feet in the grassland type.

Data are presented for surface run-off, subsurface or percolation flow, and soil erosion for the period from June 1, 1935 to May 30, 1948, as influenced by precipitation, grazing treatment, and vegetal covering. It may be concluded that (a) most surface run-off and soil erosion occur during summer as a result of the characteristic short-duration, high-intensity summer thunderstorms, (b) most of the water yield occurs during winter and as a percolation flow from the long duration, low-intensity storms characteristic of this season, (c) marked increases in summer surface run-off and erosion and significant decreases in average areal infiltration capacities result from overgrazing use whereas the amount of winter percolation appears to be independent of grazing treatment, and (d) results from a late summer general-type storm appear to be intermediate between those of summer and winter.

These data lend support to the axiom that maximum amounts of sediment-free water come from areas with good grass cover and that soil erosion is greatest where vegetation densities have been markedly decreased as by overgrazing use.

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CLIMATOLOGY SINCE THE YEAR 1800.

By John Leighly; Amer. Geo. Union, Trans., Vol. 30, No. 5, pp. 658-672. October 1949.

Most of the work done in climatology in the past 150 years can be assigned to one of the following classes of investigation or presentation: empirical formulation of climatic data, descriptive climatology, climatologic cartography, organization of observational data by synoptic categories, investigation of the physical bases of climate, definition of climatic types and the delineation of climatic regions, and reconstruction of past climates. Although their relative importance has varied, through much of the period under consideration all these fields have been cultivated simultaneously. Especially in the latter part of the Nineteenth and the early part of the Twentieth Century, climatology has been too strongly dominated by a descriptive approach. Satisfactory physical interpretations of the phenomena recorded have often been impossible, but even the physical insights available at any given time have not always been applied. It would appear that the rational treatment of climatologic data can be attained more readily through synoptic concepts than through a frontal attack with the general formulations provided by physical theory.

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EFFECT OF RAINFALL ON MAGNITUDE AND FREQUENCY OF PEAK RATES OF SURFACE RUNOFF.

By W. D. Potter; Amer. Geo. Union, Trans., Vol. 30, No. 5, pp. 735-751. October 1949.

This study establishes a relationship between rainfall intensity and peak rates of surface runoff, and uses that relationship to estimate the peak rates of runoff that might be expected for various recurrence intervals. The procedures thus developed are utilized to determine the effect of intensity and amount of rainfall and number of excessive storms on the magnitude of peak rates of runoff for various frequencies. The relationships developed in the study are also utilized to adjust peak rates of runoff from watersheds of like physiography and land use for differences in rainfall.

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NATURAL WATER LOSSES IN MOUNTAIN DRAINAGE AREAS OF SOUTHERN CALIFORNIA.

By Harold C. Troxell and Harlowe M. Stafford; Amer. Geo. Union, Trans., Vol. 30, No. 5, pp. 752-758. October 1949.

For twenty-five small mountain drainage areas of Southern California, natural water losses are shown to vary with basin altitude, and with estimated absorptive and retentive characteristics

of the drainage areas. Among other relationships demonstrated is the increase of the annual natural water loss with increased annual precipitation to an optimum, beyond which the loss is about uniform regardless of increased precipitation.

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PRELIMINARY STUDIES ON SOIL PERMEABILITY AND ITS APPLICATION.

By Leonard Schiff and F. R. Dreibelbis; Amer. Geo. Union, Trans., Vol. 30, No. 5, pp. 759-766. October 1949.

The procedure of a preliminary study on soil permeability is described. Water was applied to soil cores at their initial field soil moisture content in such a way as to simulate natural conditions. Data are presented showing variation of transmission rates and percolation rates with initial field soil moisture content for the top-soil and subsoil of Muskingum silt loam and Keene silt loam. Some comparisons were made with transmission rates and percolation rates obtained by hydrograph analysis and soil moisture changes of small watersheds under natural conditions. The data indicate considerable replication appears necessary to obtain average representative values by the core method. Even when sufficient replication establishes significant values, core data must be applied with caution and preferably in the light of watershed performance. Potential infiltration rate curves are established based on transmission rates and soil moisture changes. The use of such curves for estimating surface supplies to runoff is indicated.

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CONVEYANCE LOSS AND CANAL LINING INVESTIGATIONS.

By C. W. Lauritzen and G. W. Israelson; USDA-SCS, Utah Agr. Exp. Sta., and Bur. of Reclamation, Logan, Utah. June 1940.

This is a progress report of studies conducted on seepage losses from canals, their measurement and the lining of canals to reduce these losses. The material presented is confined to the progress made during 1948 and the first six months of 1949.

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USE THE LAND AND SAVE THE SOIL.

By R. H. Musser; USDA-Soil Conservation Service, PA-71. September 1949.

The author explains the soil and water conservation program and tells how the Soil Conservation Service assists farmers and landowners.

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RESPONSES OF COTTON TO 2,4-D.

By David R. Ergle and A. A. Dunlap; Texas Agr. Exp. Sta. Bul. 713. September 1949.

This bulletin gives the results of some experimental tests with extremely light applications of 2,4-D to cotton under partially controlled greenhouse conditions. Certain applications of minute amounts of 2,4-D caused some foliage distortion without noticeably affecting the set of bolls or the yield of seed cotton. Slightly heavier applications caused much disturbance in normal growth of the plant, variations in certain chemical plant constituents and reduction in final yield. Calculations based upon this work indicate that one ounce of 2,4-D could possibly cause serious damage to every plant in 35 acres of cotton, if uniformly distributed.

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HOW TO BUILD A FARM POND.

By Walter S. Atkinson; USDA Leaflet No. 259. September 1949.

The author explains how to build and maintain a good farm pond, formed by an earthen dam. The recommendations are for ponds that have small watersheds - that is, watersheds of less than 30 acres.

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THE SHEARER "TRASH CULTI-SEEDER".

By R. I. Herroit; Power Farming, Vol. 58, No. 10, pp. 17-19, Sydney, Australia. October 1949.

John Shearer and Sons have perfected and produced a machine which they claim: (a) will leave straw or trash on the surface and which is also suitable for sowing and renovating pasture lands; (b) will anchor straw or trash, thus preventing wind and water erosion and increase water absorption; and (c) which is choke-proof even in the most dense stubble and trash. The machine and its use are described and illustrated.

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SOIL-ROOT RELATIONSHIPS OF CERTAIN NATIVE GRASSES IN VARIOUS SOIL TYPES.

By J. E. Weaver and R. W. Darland; Ecological Monographs, Vol. 19, pp. 303-338. October 1949.

A new method has been devised which consists of obtaining representative samples of entire root systems. It permits the studying of the intimate relations of roots and soils, and of measuring root production quantitatively at various soil levels. This, together with more exact mapping of soils, a better understanding of the relationships of one soil type to another, and

especially the greater accuracy and detail with which soil profiles are now described, make it possible to ascertain more definite relationships between the roots of grasses and the soil in which they grow.

A NEW TECHNIC FOR DETERMINING WILTING PERCENTAGE OF SOIL.

By Edward Breazeale and W. T. McGeorge; Soil Sci., Vol. 68, No. 5, pp. 371-374. November 1949.

A PIEZOMETER METHOD FOR MEASURING PERMEABILITY OF SOIL IN SITE BELOW A WATER TABLE.

By J. N. Luthin and Don Kirkman; Soil Science, Vol. 68, No. 5, pp. 349-358. November 1949.

A method of measuring soil permeability in the field below a water table is presented. Pipes are driven into the soil below a water table; the soil drilled out of the pipe, and the rate of rise of the water in the pipes is measured. The soil permeability is then calculated from this rate of rise by means of an appropriate formula. Certain geometric constants occur in the permeability formula. These constants are determined in the laboratory with a three-dimensional electrical analogue of the ground-water flow problem.

Tomato plants were grown in pots of soil until they were 1 to 2 months old. At this stage the lower limbs were stripped of leaves so as to give a bare stem length of 10 cm. above the surface of the soil. Glass tubing 3 cm. by 5 cm., was then slipped over the plant and a cork stopper fitted to the bottom of the tube and sealed in place with a paraffin-beeswax mixture to make a watertight seal. The soil was poured into the glass tube around the stem, and then the required amount of tap water was added to bring the soil to a desired moisture percentage. A cork fitting was made to the top of the glass tube to complete the watertight seal of the jacket. By this technic it is possible to grow a healthy plant in a large pot of soil which can be kept at optimum moisture content and produce another set of roots on the stem surrounded by soil in the glass jacket.

PRESSURE POTENTIAL OF WATER MOVING DOWNWARD INTO SOIL.

By T. J. Marshall and G. B. Stirk; Soil Sci., Vol. 68, No. 5, pp. 359-370. November 1949.

The pressure potential of water was measured during entry into uniform soil in the field and into packed columns of sand, loam, and clay. During the application of water, the pressure potential at depths greater than 5 cm. did not vary with depth within the transmission zone of the sand and loam columns and of the field soil. There was a slight decrease with depth in the clay column. The pressure potential at this stage varied between -4g and -18gergs/gm. in different soils. It was not consistently affected by different methods of applying the water or by different rates of application of water as spray.

This experiment shows that the wilting percentage of a soil can be determined by the technic described. All jacketed soils reached a constant moisture percentage in 7 weeks. At the end of this period a well-developed root system had appeared in all jacketed soils. In the second part of the experiment, where the roots were already present on the jacketed stems, the time required for the soils to reach the wilting percentage was only 10 days.

MEASURING THE ECONOMIC PRODUCTIVITY OF LAND.

By W. H. Pine; Jour. of Farm Econ., Vol. 30, No. 4, pp. 777-783. November 1948.

The purpose of this paper is to describe and appraise the budget method in measuring the economic productivity of tracts of land. For purposes of measuring economic productivity, the tract of land under consideration should be an area in which the management and yields are reasonably uniform. A good soil map should provide the basis for delineating the area. A soil map may be satisfactory in general, but not necessarily in specific areas. The criteria for delineating soil areas are not always related to productivity.

At the stage of drainage where field capacity had been attained, water moved downward within the drainage zone under a driving force which was less than g dynes/gm. in uniform soil. At this stage the pressure potential increased uniformly with depth in the drainage zone. The gradient in pressure potential represented in different soils a force between -0.2g. and 0.6g dynes/gm. opposing downward movement.

The mean value of pressure potential for all depths in the drainage zone at this stage was -66g, -55g, -99g ergs/gm. in the field soil and in the sand and loam columns, respectively. The rate of drainage was extremely slow in the clay column, and a higher volume of -35g ergs/gm. was adopted in that case.

WHAT'S UNDER THE TREES?

By Herbert A. Lunt; Frontiers of Plant Science, Vol. 11, No. 1, p. 3. November 1949.

Forest type and soil maps are essential to

modern timber management. There is a growing recognition of the importance of the soil beneath the trees and the role it plays in determining the character of the stand and its yield in lumber or cordwood. Like any farm crop, trees need moisture and plant food from the soil. Moisture relations may be indicated by the soil type. In some instances moisture conditions vary within a given soil type because of topographic position.

A five-year-old planting of white pine on Hartford sandy loam grew 27 per cent faster than on identical planting on Merrimac loamy soil not more than 350 feet away. The increase with Norway spruce was even greater - nearly 90 per cent. Here the difference was not one of soil series such as - Hartford vs. Merrimac - but rather that of soil texture and moisture supply. The substratum of the Hartford sandy loam was considerably more moist and tree roots penetrated to a greater depth than on the block of Merrimac loamy sand.

FOOD FOR THOUGHT ABOUT FOOD.

By Firman E. Bear; What's New in Crops and Soils. Vol. 2, No. 3, pp. 6-13. December 1949.

The author outlines the potentialities for food and fiber production in the United States in relation to our future needs. He starts with the population and plans for a population of 200 million by the year 2,000. He discusses a number of factors that need to be considered and reaches the conclusion that we are to have no fear whatever of any lack of capacity to feed ourselves permanently in accordance with our desires.

NEW SPRIG PLANTER SAVES LABOR.

By W. M. Nixon; What's New in Crops and Soils. Vol. 2, No. 3, pp. 14-15. December 1949.

A new planter, which plants Bermuda grass sprigs at the rate of over 1.5 acres per hour is described and its use illustrated. It replaces the labor of from 2 to 4 men and its success is widely recognized.

FOREST WASTE PRODUCTS MAY PROVE VALUABLE IN REBUILDING OUR SOIL.

What's New in Crops and Soils, Vol. 2, No. 3, p. 21. December 1949.

This is a brief review of studies conducted on the use of sulfite liquor as a source of lignin, the use of which has been found to improve soil structure.

MEASUREMENT OF SOIL MOISTURE BY THE ELECTRICAL RESISTANCE METHOD.

By G. J. Bouyoucos and G. A. Crabb, Jr.; Agr. Eng. Vol. 30, No. 12, pp. 581-583. December 1949.

The authors discuss the plaster of paris and nylon resistance elements used in the electrical resistance method of determining soil moisture and the modification of the wheatstone bridge, known as the Bouyoucos Model C resistance bridge in detail. Certain other types of resistance elements are discussed briefly also.

A MODIFIED VENTURI SECTION FOR MEASURING IRRIGATION WATER IN OPEN CHANNELS.

By J. E. Ferguson and J. E. Carton; Agr. Eng., Vol. 30, No. 12, pp. 584-585. December 1949.

The modified venturi section is formed by introducing a curved cover section into a rectangular flume. The closed section thus formed becomes a modified venturi tube with a rectangular throat section. Such a device may be constructed with either a fixed or adjustable throat area.

SAND LOVEGRASS MAKES A COME-BACK.

By M. D. Atkins and A. J. Longley; USDA Soil Conservation, Vol. 15, No. 6, pp. 138-141. January 1950.

Sand lovegrass, a native of the sandy lands in much of the Great Plains where it became almost extinct 10 years ago, is making a remarkable come-back in Kansas. This is important from both the conservation and the grazing standpoints, since sand lovegrass is about the best plant available for erosion control on hundreds of thousands of acres of sand-hill lands in Kansas and Nebraska that are low in fertility and now produce little forage of value for grazing. A carefully planned seed production program and better management of grazing lands are the two major factors contributing to its come-back.

RUNOFF ESTIMATES BASED ON INFILTRATION CAPACITY, ANTECEDENT MOISTURE CONDITIONS, AND PRECIPITATION.

By R. G. Andrews; Agr. Eng., Vol. 31, No. 1, pp. 26-28. January 1950.

This discussion deals with the mechanics of applying the basic theory of the infiltration method in estimating the runoff which will result from a particular storm period on a particular watershed. The methodology described is the result of an evolutionary process.

The method recognizes that: (1) only surface runoff can be estimated from infiltration data; (2) an infiltration curve can represent only one complex; (3) the runoff from a watershed must always be considered as a summation of the volumes of runoff from the individual complexes which make up the watershed.

IRRIGATED PASTURES FOR DAIRY COWS.

By John A. Ewing and George E. Zerfoss; Agr. Eng. Vol. 31, No. 1, pp. 24-25. January 1950.

This paper reports a summary of results of a four-year study of pasture irrigation for dairy cows conducted at Columbia, Tennessee. The study was aimed at determining the merits and economy of supplemental irrigation on pastures; investigating the effect of pasture irrigation on milk production, number of cow-pasture days needed for supplemental feed, and growth or development of animals; and determining the effect of supplemental irrigation on the prolonged maintenance and quality of yields and general condition of pasture. It was concluded that pasture irrigation for dairy cows under the conditions of the test is justified and profitable.

PRELIMINARY RESULTS WITH UPLAND PASTURE DEVELOPMENT IN THE SOUTHERN PIEDMONT.

By B. H. Hendrickson; USDA, SCS, Watkinsville, Georgia. Mimeo. September 30, 1949.

The author discusses the possibilities of pasture development in connection with the use of large acreage of idle and abandoned land in the southeast. He discusses the several factors to be considered in developing pastures and outlines procedure in developing a successful pasture program.

HOW NUTRIENTS REMOVED FROM SOIL BY HARVESTED CROPS ARE REPLACED BY FERTILIZERS.

By A. L. Mehring and R. Q. Parks; Agr. Chemicals. October and November 1949.

This paper is devoted primarily to a summary by regions and states of the 1947 data for nitrogen, phosphoric acid and potash removal by harvesting crops and additions by applications of fertilizer and manure. The relative importance by regions of other factors relating to fertility trends is discussed briefly.

GRASS WATERWAYS.

By Harry H. Gardner and Edwin Freyburger; USDA Leaflet No. 257. December 1949.

The authors explain the function of grass waterways and list and describe various steps in establishing them.

DUST STORMS COME FROM THE POORER LANDS.

By H. H. Finnell; USDA Leaflet No. 260. September 1949.

The author reports the results of a study made in 1947 on some 2,347,000 acres of land in 7 counties in the heart of the old dust bowl in Colorado, Oklahoma and Kansas. A similar study had been made on the same area in 1936; hence, he was able to compare the land conditions of the two periods and determine what changes had taken place during the 11 years.

The study revealed that land which was poor at the time it was put in cultivation was the first to be abandoned as a rule. Likewise, it was found that most of the abandoned land which was later reclaimed was a better class of land to start with. In other words, most of the dust storms of the thirties came from the poorer land. While some of the better land was abandoned during the 1930's and did blow to some extent, it was usually not severely and permanently damaged and was later reclaimed and placed back in cultivation.

SOUTHWESTERN TREES AND SHRUBS - DESERT WILLOW.

By B. W. Allred; Sheep and Goat Raiser, Vol. 30, No. 4, p. 15. December 1949.

The desert willow never becomes more than a small shrub on dry sites, but may develop into a tree six inches in diameter and 30 feet in height where water is plentiful. It is used more than any other native southwestern woody plant for erosion control purposes. Along arroyos and on out-wash slopes it forms natural thickets which prevent soil erosion.

SOUTHWESTERN TREES AND SHRUBS - GUAYCAN.

By B. W. Allred; Sheep and Goat Raiser, Vol. 30, No. 4, p. 35. January 1950.

The author describes Guaycan and discusses its economic and soil conservation values.

GRAZING STUDIES ON THE AMARILLO CONSERVATION EXPERIMENT STATION 1943-49.

By Charles J. Whitfield, John H. Jones and John P. Baker; Texas Agr. Exp. Sta. Bul. 717. December 1949.

This bulletin gives a summary of the grazing studies made on the Amarillo Conservation Experiment Station from 1943 through 1949. Investigations have been made of the grazing values of: (1) native blue grama-buffalo grass pasturage; (2) seeded cool-season grasses, such as crested wheatgrass and western wheatgrass; and (3) temporary pasture crops, such as Sudan grass and winter wheat. Tables show the gains made from these various types of pasturage.

Forage production and the chemical composition during different seasons of the year for the important plants studied are also presented. With favorable rainfall, a well balanced, year-round, green grazing program for this section of the Southern Great Plains may be had from a combination of the following pasturage: winter - winter wheat, crested wheatgrass and western wheatgrass; spring - crested wheatgrass, western wheatgrass, little barley and early weeds; summer - blue grama, buffalo grass, Sudan grass and late weeds; and fall - crested wheatgrass, western wheatgrass and winter wheat.

GRASSES AND LEGUMES FOR SOIL CONSERVATION IN THE PACIFIC NORTHWEST.

By A. L. Hafenrichter, Lowell A. Mullen and Robert L. Brown; USDA, Misc. Pub. No. 678. December 1949.

This publication describes the use of grasses and legumes for soil conservation on farms and ranches in the Pacific Northwest. The information is based on 12 years of observational and testing work in nurseries and on farms in soil conservation districts under actual field conditions.

More than 7,000 accessions of grasses and 500 accessions of legumes have been observed and tested. Of this number 5,700 were collected from the native vegetation of the Northwestern States and brought into the nurseries for observation as to their value for soil conservation use in any locality or wherever adaptable in useful rotations. In addition, a number of accessions came from experiment stations in the United States and Canada. The observational testing of such a large number of plants was facilitated by dividing them into groups that reflected a use or a common quality affecting use in soil and water conservation. The information is presented in this manner. The species in each group are divided into those of primary importance, those of secondary importance, and those that have been discarded. Many species of primary importance contain several distinct strains, climatic races, or varieties, and the differences are described.

The use of conservation seedings for green manure, hay, pasture, range, crop rotations, and silage by farmers and ranchers is recognized, and the value of the materials for these purposes is recorded.

A map of the Pacific Northwest has been made showing agricultural zones, and the adaptation of each grass and legume to these zones is given. The zones were made according to the different combinations of rainfall, elevation, length of season, severity of erosion, and soils that affect adaptation and use of crops and the choice of grasses and legumes for soil and water conservation.

CLASSIFICATION OF LAND ACCORDING TO ITS CAPABILITY AS A BASIS FOR A SOIL CONSERVATION PROGRAM.

By Roy D. Hockensmith; Proc. of the Inter-American Conference on Conservation of Renewable Natural Resources, Denver, Colorado, September 7-20, 1948, pp. 450-465. USDA, SCS, Washington, D. C. December 1949.

The land-capability classification is a systematic arrangement of different kinds of land according to those properties that determine the ability of the land to produce permanently. Suitability for cultivation is assumed to include the use of machinery - at least of plows, tillage implements, and harvesting equipment - and capacity for a significant yield of one or more crops with suitable treatment and protective measures. The degree of permanent limitation imposed by natural land characteristics necessarily affects; (a) the number and complexity of the corrective practices; (b) the productivity; and (c) the intensity and manner of land use - for example, the choice of crops on cropland or the amount and season of use on grazing land.

The classification is made and used for a practical purpose, which is the selection and application of land uses and treatments that will (a) use the land, and (b) keep it in condition for long-time production. The latter involves erosion control and other maintenance.

MORE FISH AND GAME.

By Verne E. Davison; Better Crops with Plant Food, Vol. 34, No. 1, pp. 23-25 and 45-46. January 1950.

Anyone who owns land can improve it; can make it produce more game or fish or both. The right to good hunting and good fishing must be earned by dependable effort to produce the game and fish we seek. The productivity of land and waters for wildlife can be increased by choosing the plants desired and excluding the useless ones.

It is being done with farm ponds for fish, with bicolor lespedeza for quail, with multiflora rose for rabbits, and in a general way for several kinds of wild creatures by the land-use improvements inherent with application of the best soil and water conservation measures. The use of fertilizer, soil culture and the right kinds of soil and water conservation measures is essential in over-coming the common deficiencies of natural climate, plant growth and soil.

Failures come from two major causes; first, unsound site selection - too much water or silt or both in ponds; land too wet or subject to grazing in the case of bicolor plantings. Second, failure to fertilize the clear waters of ponds sufficiently; and failure to feed bicolor with the phosphate and potash which a vigorous growth requires to produce a heavy crop of seed.

STREAMBANK PLANTINGS FOR EROSION CONTROL IN THE NORTHEAST.

By Frank C. Edminster; USDA Leaflet No. 258. December 1949.

A good plant cover on the banks would prevent much of the erosion of streambanks. When this cover is torn away its restoration greatly helps to cut down the rate of erosion and improve the waterway. Smaller streambanks may be held with plantings alone. Many of the larger banks need stone structures in addition. Stone work is costly and often requires public financing and the joint effort of many landowners. This leaflet described only the treatment of those banks that can be protected with plants. Simple mechanical aids are briefly outlined.

COTTON ROOT ROT AND LAND USE STUDIES AT THE BLACKLAND STATION.

By R. J. Hervey and J. R. Johnston; Texas Agr. Exp. Sta. Progress Report 1214. January 17, 1950.

A series of cropping system studies involving rotations of 1- and 2-year cycles were initiated in 1947 to determine the combined effect of soil productivity level and different cropping systems on root rot and yield. On the basis of the present data, disease incidence and yield are not significantly affected on Class I land, regardless of the cropping system employed. On Class II and Class III land, cropping systems involving other crops in addition to cotton, greatly increased yields and decreased root rot. The yield increased 50 to 100 per cent on Class II land over the continuous cotton system, while the yield increased 500 to 800 per cent on Class III land. On the poorest land, cropping systems involving legumes alone or legume-oats mixtures produced the highest yields. On Class II land,

the highest yielding systems involved corn or sorghum. It appears that the selection of a proper cropping system may be dependent on the productivity level of the soil in question.

SOIL DEPLETION PLOTS.

By E. C. Simon; Sugar Journal, Vol. 9, No. 4, pp. 12, 13 and 20. September 1946.

By reversing the practice of using a system of soil management from a good system to a poor one the original soil fertility of a plot of fertile Mississippi River Alluvial soil has been greatly reduced since the project started in 1929. From a level of very high production, the production of plant cane in the fourth cycle was lower than that of the fourth year stubble cane of the first cycle.

SOUTHWESTERN TREES AND SHRUBS - HENEQUEN.

By B. W. Allred; Sheep and Goat Raiser, Vol. 30, No. 5, pp. 14-15. February 1950.

The author discusses the use of henequen or sisal hemp.

A SURVEY OF THE MINOR-ELEMENT SITUATION.

By Firman E. Bear; Jour. of Soil and Water Conservation, Vol. 5, No. 1, pp. 11-12. January 1950.

The author presents a comprehensive review of the present situation relative to the need of minor-elements in the nutrition of both plants and animals.

A WATER COST OF RUNOFF CONTROL.

By A. R. Croft; Jour. of Soil and Water Conservation, Vol. 5, No. 1, pp. 13-15. January 1950.

Studies in Utah show that the deep rooted aspen trees take more water from the soil than shallow rooted herbaceous plants. Cutting aspen trees and leaving only herbaceous plants increased the amount of water available for stream flow. The herbaceous cover thus far has been equal to aspen in preventing erosion. This suggests that replacement of deep rooted plants by shallow rooted ones may be a means of increasing stream flow.

IMPROVING FARM IRRIGATION PRACTICES.

By Wayne D. Criddle; Jour. of Soil and Water Conservation, Vol. 5, No. 1, pp. 18-22. January 1950.

Many serious land and water problems confronting irrigated agriculture today are a result of man's misuse of these resources. It is only over the past few years that man has begun to realize the need for better farm irrigation practices throughout the west. Streaks of yellow now appearing in his once black topsoil, alkali accumulations and waterlogging of the lower lands, and decreased yields cause a thinking farmer to stop and take stock of the careless use that has been made of his land and water.

Although irrigation has been practiced for more than 100 years in parts of the west, methods and practices in the use of irrigation water has improved little. In fact, it is probably safe to say that the poorer irrigation practices are found on the older irrigated lands and better practices on the newer lands.

GROWTH AND YIELD OF COTTON ON WILLACY LOAM AS AFFECTED BY DIFFERENT IRRIGATION LEVELS.

By M. E. Bloodworth, W. R. Cowley and J. S. Morris; Texas Agr. Exp. Sta. Progress Report 1217. January 24, 1950.

A study of the growth and yield of cotton under different levels of irrigation and with spacings of 6, 12 and 18 inches within 36-inch rows was conducted during 1949. The growth of cotton was significantly influenced by the addition of water.

The average height of plants of the three spacings in the high-irrigation level treatments at the time of defoliation was approximately 18 per cent greater than that of those grown under the medium-moisture level. Although there was little difference in the average heights of all plants under the medium and low-irrigation level, the difference in the density and color of foliage was evident in the field. The height of the plants in all treatments receiving irrigation water was significantly greater than those in the non-irrigated plots. The trend toward increased plant height at the wider spacings is evident in all but the low-moisture level treatment.

A PRACTICAL SOIL MOISTURE METER AS A SCIENTIFIC GUIDE TO IRRIGATION PRACTICES.

By George John Bouyoucos; Agron. Jour., Vol. 42, No. 2, pp. 104-107. February 1950.

The author presents a simple, quick, and practical method of measuring the available moisture content of soils. This method indicates when and how much it is necessary to irrigate, and how

deep the applied water has penetrated the soil. It can be used as a guide to enable a farmer to irrigate more scientifically and intelligently.

The method consists of an alternating current impedance meter and a plaster of paris block with two electrodes imbedded inside. The method is called the plaster of paris electrical resistance method. It measures soil moisture electrically in a matter of seconds.

THE USE OF THE NITROGEN ISOTOPE N^{15} IN FIELD STUDIES WITH OATS.

By W. V. Bartholomew, L. B. Nelson and C. H. Werkman; Agron. Jour., Vol. 42, No. 2, pp. 100-103. February 1950.

A field experiment with oats was conducted on a loessial prairie soil in western Iowa using ammonium sulphate labeled with the nitrogen isotope N^{15} . The results show marked differential uptake of fertilizer nitrogen when applied at different rates and times.

The fertilizer nitrogen comprised from 4.7 to 17.9 per cent of the total nitrogen in the plant, and the recovery of the nitrogen from the fertilizer ranged from 11.0 to 29.3 per cent. The percentage of the total nitrogen in the plant coming from the fertilizer was greater from 40 pounds of N per acre than from 20 pounds. Conversely, a smaller percentage of the fertilizer nitrogen was recovered from the 40-pound rate than from the 20-pound rate. The order of fertilizer nitrogen recovery relative to the time of application is as follows: at seeding > grass stage > boot stage.

MEASURING WELL WATER.

By H. R. McDonald; The Reclamation Era, Vol. 36, No. 3, pp. 52-54. March 1950.

The author explains how to figure out how many gallons of water per minute flow from pumps which discharge water from horizontal pipes, or pipes discharging at an angle of less than 90°.

GETTING RID OF JOHNSON GRASS.

By H. F. Arle; The Reclamation Era, Vol. 36, No. 3, pp. 58-60. March 1950.

Johnson grass can be eradicated by spraying with undiluted aromatic oils at 3 to 4 week intervals. The number of sprayings needed depends mainly upon the soil moisture, soil fertility, and soil type. In some cases Johnson grass was completely eradicated with only four applications, while

in other cases nine treatments were required. The amount of oil necessary for complete eradication ranged from 500 to 725 gallons per acre.

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VEDERNIKOV'S CRITERION FOR ULTRA-RAPID FLOW.

By Ralph W. Powell; Trans. Amer. Geo. Union, Vol. 29, No. 6, pp. 882-886. December 1948.

A criterion is given for the stability of steady uniform flow in open channels. When this number exceeds one, the flow is ultra-rapid, roll waves form, and the flow cannot be steady. This criterion is compared with several which have been proposed, and is judged to be more comprehensive and exact.

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THE PERMANENT WILTING PERCENTAGE AS A REFERENCE FOR THE MEASUREMENT OF SOIL MOISTURE.

By F. J. Veihmeyer and A. H. Hendrickson; Trans. Amer. Geo. Union, Vol. 29, No. 6, pp. 887-896. December 1948.

Soil moisture as usually reported as a percentage on a dry-weight basis without reference to some standard or base for comparison is of limited value. Arbitrary definitions of the kinds of water in soil convey only qualitative ideas. It is shown that the permanent wilting percentage is remarkably constant and that in regions of rainless summers this moisture condition is reached year after year in the soil below the surface layer which is affected by surface evaporation. Soil-moisture extraction curves slope downward approximately uniformly until the permanent wilting percentage is reached. Then the curves continue nearly horizontal. The soil moisture is slowly reduced to a minimum which is slightly below the permanent wilting percentage. The permanent wilting percentage is a satisfactory reference point from which the amount of readily available water and also the amount needed to raise the soil to its field capacity may be calculated.

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CONSERVATION METHODS IN COTTON PRODUCTION.

By B. H. Hendrickson, USDA, Misc. Publ. No. 694. October 1949.

The conservation of their cropland is the most important and difficult land problem of Cotton Belt farmers. Practical farming methods which reduce both soil and water losses while improving the productivity of the erosion-damaged soil are required.

Frequent high-intensity rainstorms and the resultant damage caused by splash of raindrops and

wash of runoff waters on row-cropped farm land account for the major portion of the erosion. Such storms occur most often during the main cotton growing season at a time when the land is particularly vulnerable to the ravages of these erosive agents.

At this season cotton land is exposed to the direct impact of falling raindrops and is heavily damaged by raindrop splash. The soil-dispersing action of raindrop impact also causes puddling, pore-clogging, and sealing of the soil surface. Thus, infiltration of rain water into the soil is lessened and runoff and erosion are increased. The most effective way to prevent the damaging effect of rainfall is to keep the raindrops from striking the soil surface. This can be accomplished by keeping the surface of the ground adequately protected by vegetal cover through the use of cover crops, crop residues, and mulches as well as by forcing rapid growth of the cotton crop. Terraces and other contour operations may be needed to get runoff water safely across sloping cropland.

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WHAT TO LOOK FOR IN A SUB-SURFACE TILLER.

By Torlief S. Aasheim; Montana Farmer Stockman. March 1, 1950.

Stubble mulch tillage, which leaves stubble and other crop residue on the surface of the ground, is probably the best single practice for controlling erosion on dry land fallow in Montana. It has been demonstrated that this type of fallow preparation will result in about the same yield as other methods of fallow when erosion is not a factor. During years when wind erosion destroys the crop on unprotected fallow, substantial increases in yield may be expected on protected fallow. The cultivators which are designed to cultivate the soil and leave the stubble on the surface are called sub-surface tillers. Sub-surface tillers should be of the proper size, have plenty of clearance, be sturdy in construction, and have weed killing ability.

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THE EFFECT OF TILLAGE METHODS ON SOIL AND MOISTURE CONSERVATION IN THE PLAINS AREA OF NORTHERN MONTANA.

By Torlief S. Aasheim; Mont. Agr. Exp. Sta. Bul. 468. December 1949.

This bulletin is a summary of the results obtained through studies on tillage methods and methods of handling crop residues which were started near Froid in 1940 and near Harve in 1941. Methods and equipment used most satisfactorily in carrying out a system of stubble mulch summer fallow are discussed.

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PROPERTIES OF SOIL WHICH INFLUENCE WIND EROSION.
I. THE GOVERNING PRINCIPLE OF SURFACE ROUGHNESS.

By W. S. Chepil; Soil Science, Vol. 69, No. 2,
pp. 149-162. February 1950.

This study was conducted for the purpose of gaining more adequate information on the generally recognized but little understood relationship between erodibility of soils and their physical condition and structure. It was concluded that the amount of soil erodible by wind is limited by the critical height of and distance between the unerodible fractions that are exposed at the surface to the wind. The ratio of height of surface projections to the distance between projections after soil removal has ceased, tends to remain constant irrespective of the size and proportion of the nonerodible clods contained in the soil. The ratio varies with other factors, however, such as wind velocity and size, shape and apparent specific gravity of the erodible fractions. These factors, as a whole, add considerably to the complexity of the erosional phenomenon.

EFFECT OF GASEOUS PHASE ON WATER-STABLE SYNTHETIC AGGREGATES.

By Andrew P. Mazurak; Soil Sci., Vol. 69, No. 2,
pp. 135-148. February 1950.

The evidence obtained from dispersion measurements with synthetic hydrogen aggregates from expanding and non-expanding crystal-lattice types of clay minerals suggests that the gaseous phase not only has a disruptive influence but also a protective effect and aids in maintaining the stability of smaller aggregates. The results of the experiment also suggest a standard method in wetting dry aggregates for their measurement of size distribution in water.

SIGNIFICANCE OF CARBONATES IN IRRIGATION WATERS.

By Frank M. Eaton; Soil Sci., Vol. 69, No. 2, pp.
123-133. February 1950.

When lands are irrigated with water containing more than twice as much sodium as calcium and magnesium, permeability is likely to be impaired. This relation in water supplies is customarily expressed as percentage sodium. Water with a low initial percentage sodium may give rise to a high-sodium soil solution by means of calcium carbonate precipitation, whereas the percentage sodium of other waters with little $\text{CO}_3 + \text{HCO}_3$ will change little during evaporation. That the magnitude of the possible change, in the soil, of percentage sodium may be taken into account in appraising water quality, it is suggested that both the percentage sodium "found" and the per-

centage sodium "possible", as well as residual sodium carbonate, might be profitably reported in conjunction with analyses of irrigation waters.

EFFECT OF FUMIGANTS AND OTHER SOIL TREATMENTS IN THE GREENHOUSE ON THE FUNGUS POPULATION OF OLD CITRUS SOIL.

By James P. Martin; Soil Sci., Vol. 69, No. 2,
pp. 107-122. February 1950.

Treatment of old citrus and noncitrus soils by steam under pressure or by leaching, or with various fumigants, fungicides, or insecticides, followed by cropping with sour or sweet orange seedlings or with tomatoes, markedly affected the nature of the fungus population of the soil.

After initial destruction or near destruction of the fungus populations of these soils, fungi again established themselves, although the kinds and numbers established varied greatly between treatments and between replicate plots of the same treatment, and represented few species in comparison with the wide variety originally present.

The possible significance of the effect of altering the microbial equilibrium of the soil by partial soil sterilization on the growth of citrus in old citrus soils is discussed.

A SIMPLE VOLUME-WEIGHT SAMPLER AND PROCEDURE.

By E. J. Dortignac; Soil Sci., Vol. 69, No. 2,
pp. 95-105. February 1950.

A volume-weight sampler and procedure are described for determining porosity of soils. The instrument is simple and inexpensive and has been used successfully on both cultivated and mountain soils. The field procedure suggested for determining relative distribution of pore sizes is readily used in conjunction with artificial rain-maker and irrigation experiments. It can also be used after natural precipitation has saturated the soil horizon to be sampled. This field method is simple and rapid for surface soils, but more time-consuming for deeper soil horizons. The laboratory work involves merely weighing and oven-drying soil samples.

THE ROLE OF THE ATMOSPHERE IN THE HYDROLOGIC CYCLE.

By George S. Benton, Robert T. Blackburn and Vernon O. Snead; Trans. Amer. Geo. Union, Vol. 31, No. 1, pp. 61-73. February 1950.

Present day understanding of the hydrologic cycle is limited by the fact that little data have been compiled concerning mass movements of water in the atmosphere. As a result, relationships between precipitation, evapotranspiration, and runoff have been obscured. The role of the atmosphere in the hydrologic cycle is discussed, and the relationship of the hydrologic cycle to the air mass cycle is clarified. Taking the Mississippi Watershed as an example, quantitative estimates are prepared of the percentage of precipitation occurring from, and of evapotranspiration occurring into, maritime and continental air masses. These estimates are based upon quantitative studies for selected stations within the watershed. Pilot balloon and radiosonde data are utilized to determine the total flux of moisture in maritime and in continental air into the Mississippi Watershed. From these data a complete balance of the hydrologic cycle for the Mississippi Watershed is prepared. The results of this investigation are then used in analyzing the various phases of the hydrologic cycle. It is shown that only a small percentage of the maritime moisture advected over the continents is ever precipitated; that in spite of this fact most precipitation occurs from maritime air and is derived directly from oceanic sources; and that the modification of the evapotranspiration regime even over a widespread area can have comparatively little direct effect on the average quantity of precipitation recorded over that or neighboring regions.

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EFFECTS OF PARTICLE SHAPE ON SETTLING VELOCITY AT LOW REYNOLDS NUMBERS.

By John S. McNown and Jamil Malaika; Trans. Amer. Geo. Union, Vol. 31, No. 1, pp. 74-82. February 1950.

Extensive theoretical and experimental studies have been conducted at the Iowa Institute of Hydraulic Research in an investigation of the effect of shape on the settling velocity of particles. A number of representative axisymmetric shapes were used in the experiments, the Reynolds numbers of the particle motion ranging from 10-4 to 10+1. Stability of orientation was also investigated. Analytical results were obtained for the motion of ellipsoids with the Stokes range by solving Oberbeck's integral equation. The ratio of the principal-axis lengths was found to be by far the most significant of the various shape factors which have been proposed. In fact, the settling velocities of particles over a wide range of shape can be estimated within ten per cent from the theoretical results for ellipsoids.

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SUMMER RAINFALL CHARACTERISTICS IN NORTHERN UTAH.

By A. R. Croft and Richard B. Marston; Trans. Amer. Geo. Union, Vol. 31, No. 1, pp. 83-95. February 1950.

This paper presents information on the frequency, depth, intensity, and areal extent of July-August cloudburst type rainfall on part of the Wasatch Mountains in northern Utah. Intensities of some rainfall bursts on the mountain land are compared with those at valley stations.

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EROSION PAVEMENT, ITS FORMATION AND SIGNIFICANCE.

By W. C. Lowdermilk and H. L. Sundling; Trans. Amer. Geo. Union, Vol. 31, No. 1, pp. 96-100. February 1950.

Erosion pavement is a relatively new term to which experimental studies in erosion have given rise. The phenomenon is not new. It may properly be said, however, to be caused by the activities of man and his agencies in removing natural mantles of vegetation, which prior to such activity had clothed the landscapes in question. Erosion pavement is the accumulation of fragments of rock at the surface of a soil, caused primarily by the removal of the fine material by raindrop splash, surface rain wash or wind. Such a layer of rock fragments is often conspicuous in old sloping fields and in overgrazed areas in soils containing rock fragments. Thus erosion pavement does not occur in loessal or alluvial soils of uniformly fine texture, where rilling and gullyng are characteristic.

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THE PLOWUP OF WESTERN GRASSLANDS AND THE RESULTANT EFFECT UPON GREAT PLAINS AGRICULTURE.

By H. H. Finnell; Paper presented at the Southwest Social Sci. Assoc., Houston, Texas. April 7-8, 1950.

In the short space of 20 to 30 years, experience has proved that shallow, moderately sandy and deep, loose sandhill soils of gentle slope or steeper cannot easily be kept productive under cultivation anywhere in the 14- to 20-inch rainfall belt. Shallow-depth hard lands, both flat and sloping, have failed in all areas of less than 18 inches average rainfall. Nearly level medium-depth moderately sandy lands, on the other hand, stood up well with suitable practices under rainfall as low as 16 inches.

Medium-depth hard lands have a fair-to-good record of performance throughout the territory sampled, but below 17 inches of rainfall a program of alternate cultivation and restoration under sod would be required to avoid the unbearable sustained heretofore. Experience indicates that the hard lands of this class got into an

unmanageable condition much more slowly than the sandy lands. In any event, the signs of overuse such as difficulty of maintaining crop residues and of getting up crop stands should be promptly heeded. The length of safe periods of cultivation must necessarily vary both with soils and with climatic conditions. Deep loamy sands with 18 to 20 inches of rainfall offer fair possibilities of maintaining fertility and stability against wind erosion by the use of green manure crops in the rotation.

Deep, nearly level hard lands, the best of the High Plains wheat soils, can be safely farmed with appropriate simple precautions wherever found.

The most stubborn fact regarding lands in the wind erosion areas, formerly known as the Dust Bowl, is that the poorer lands wear out fast.

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SELF FEEDING OF SALT-MEAL MIXTURES TO RANGE CATTLE.

By D. A. Savage; Okla. Agr. Exp. Sta. Progress Report, Mimeo. February 15, 1950.

Salt has been used successfully as a governor of cottonseed meal consumption by beef cattle in a series of self-feeding trials. The tests were conducted in direct comparison with the customary daily hand feeding of cottonseed cake made from the same meal. Strictly comparable cattle and highly uniform range pastures were used in the feeding comparisons. Preliminary results indicate that the quantity of No. 4 crushed rock salt required to maintain daily meal consumption at desired rates, on a self-fed basis, varies from one-half to three-fourth pound per head depending mainly on size of cattle.

The daily consumption of self-fed meal was held at the desired rates by mixing with such rates about one-half to five-eighths pound of salt for weaner calves, and one-half to three-fourths pound of salt for long yearlings or coming two's.

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PHOSPHORUS IN SOILS AND FERTILIZERS.

By F. W. Parker; Science, Vol. 111, No. 2879, pp. 215-220. March 3, 1950.

Experimental quantities of nine different radioactive fertilizers were made for cooperative field experiments in all sections of the country. The experiments included studies on (a) the comparative utilization of different phosphorus materials, (b) the utilization of soil and fertilizer phosphorus by different crops, and (c) the influence of phosphorus fertility of soils on the utilization of applied phosphorus. It was found that the utilization of rock phosphate

declined with increasing pH, but the utilization of superphosphate was not materially affected by the soil reaction. At the rates compared, rock phosphate was superior to superphosphate on the most acid soil. Superphosphate, however, was superior to rock phosphate on the least acid soil. Corn grown on an acid soil obtained twice as much phosphorus from superphosphate and calcium metaphosphate as from alpha tricalcium phosphate.

Under most conditions superphosphate was generally superior to other phosphatic materials used. Phosphorus in green and farm manures is approximately as efficient as phosphorus applied in superphosphate. Crops differ widely in their capacity to utilize soil and fertilizer phosphorus. The total phosphorus absorbed is influenced more by the initial level of soil phosphorus than by the rate of fertilization. The phosphorus fertility level of the soil did not materially influence the utilization of fertilizer phosphorus.

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SOIL EROSION BY RAINSTORMS.

By W. D. Ellison; Science, Vol. 111, No. 1880, pp. 245-249. March 10, 1950.

Falling raindrops and surface flow are both active erosive agents during periods of heavy rainstorms. During periods of heavy rainstorms raindrop splashed materials fall into thin films of free water on the surface of the ground and are swept down slope instead of falling back on the surface of the ground to be resplashed. Surface flow erodes by scouring the soil surface after the free water concentrates into channels.

Splash erosion can be controlled by breaking the fall velocities of raindrops before they strike the ground. This can be accomplished by the use of mulches of straw or leaves, crop residues, or with dense growths of vegetal covers on the ground. Scour erosion can be controlled by regulating the concentration and controlling the velocity of flowing water after it becomes channelized.

These two erosive agents acting separately or in unison cause four distinct types of erosion. They are gully erosion, sheet erosion, fertility erosion, and puddle erosion. Fertility erosion is the removal of the soil's fertility elements and destruction of the land's water holding capacity. It is more prevalent on sandy soils. Puddle erosion hardens and seals the surface of the land so that water does not enter freely. It occurs on silty and clay soils, or those soils which are composed mainly of the finer textured soil particles.

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SNOW SURVEYS AND IRRIGATION WATER FORECASTS FOR

COLORADO RIVER DRAINAGE BASIN.

By Div. of Irrigation, SCS, USDA and Colo. Agr. Exp. Sta., Misc. Series Paper No. 463. April 1, 1950.

Snow accumulation on the headwaters of the Upper Colorado River varied from about 140 per cent of normal on the Green River in Wyoming to about 50 per cent of normal in local areas of Southern Colorado and Northern New Mexico. Soil moisture conditions are fair to good in Colorado and excellent in Wyoming.

The snow cover at high elevations in Arizona is very low with most courses bare as of April 1. Reservoir storage is below last year and generally below the past ten year average.

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SNOW SURVEYS AND IRRIGATION WATER FORECASTS FOR RIO GRANDE DRAINAGE BASIN.

By Div. of Irrigation, SCS, USDA AND Colo. Agr. Exp. Sta. Misc. Series Paper No. 462. April 1, 1950.

The water supply outlook for the Rio Grande and its tributaries in San Luis Valley is slightly less than normal and much less favorable than a year ago. To the north of the Upper Rio Grande and along the Sangre de Cristo Range the snow cover is definitely low. There is no snow in the valley. On Northern New Mexico tributaries the snow cover decreased during March and on many snow courses the snow is less than for any April 1 since measurements were started in 1937. Soil moisture is deficient throughout the watershed.

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SNOW SURVEYS AND IRRIGATION WATER FORECASTS FOR PLATTE AND ARKANSAS DRAINAGE BASINS.

By Div. of Irrigation, SCS, USDA and Colo. Agr. Exp. Sta. Misc. Series Paper No. 464. April 1, 1950.

On the Platte and Arkansas drainage basins the snow accumulation to April 1 varies from twice normal on the Sweetwater River to about 80 per cent of normal on the headwaters of the Arkansas. In the Northern Colorado mountains forming the headwaters of the Platte Rivers snow cover is about normal. On the Wyoming drainage of the North Platte snow cover is relatively higher. Dry soil under the snow, due to lack of rainfall during the fall months will reduce the summer runoff, that would be expected from current snow cover. Soil in valley areas is dry. Irrigation reservoirs on the North and South Platte have more water in storage than a year ago. The major reservoirs on the North Platte have a record carryover from last years heavy flow.

SNOW SURVEYS AND IRRIGATION WATER FORECASTS FOR OREGON.

By W. T. Frost and R. T. Beaumont; Oregon Agr. Exp. Sta. Mimeo. Report. April 1, 1950.

Oregon's 1950 water supply outlook is "good" throughout the state with prospects nearly equal to the excellent supplies of 1943 and 1946 and better than last year in some areas. Deficiencies or shortages are not to be expected anywhere in the state if normal conditions of snow-melt and runoff prevail. New records of runoff will be established in the Deschutes watersheds with unusually high flows to be expected on Willamette River tributaries draining the western Cascade slope from the Coast Fork and Row River north to and including the Santiam River.

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SNOW SURVEYS AND IRRIGATION WATER FORECASTS FOR UTAH.

By Gregory L. Pearson; Utah Agr. Exp. Sta., Mimeo. Report. April 1, 1950.

Considerable variation is shown in the water supply prospects for Utah during 1950. The water supply is excellent in the northern and northeastern part of the state; good in the central part; and fair in the southern part, with the exception of the east fork of the Sevier River where the expected water supply is poor. The snow blanket in the Cache-Wasatch-Ashley forests is considerably above normal in water content and could produce very heavy spring streamflows if combined with heavy rains and/or above normal temperatures. Reservoir storage supplies are near or considerably above the past ten-year average.

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CONSERVATION RANCHING.

By A. P. Atkins; Sheep and Goat Raiser, Vol. 30, No. 6, pp. 14-17. March 1950.

Conservation ranching is defined as an efficient standard of production which gives maximum returns over a long period of time without noticeable depletion of the range. The author relates his experiences as a practical ranchman and points out the factors he considers basic to sound conservation ranching. Among these are deferred grazing, a flexible plan of operation, efficient management, and good stock.

Range conservation is largely a matter of proper management and wise use of what nature has provided. It means the selection of the kind and quantity of livestock to make the best use of any given range. It means providing stock water in ample quantities and securing grazing distribution as well as a scientific knowledge of the

range itself - its soil and its grasses, the raw materials which are converted into meat, wool, and leather.

aged these efforts, and given high hopes for success. However, these past experiments have in nearly every case taken from three to five years before conclusive results were apparent.

SOME EFFECTS OF THE 1946-48 DROUGHT ON RANGES IN SOUTHWEST TEXAS.

By Ben Osborn; Jour. of Range Mgt., Vol. 3, No. 1, pp. 1-15. January 1950.

Serious changes in range condition are apparent after three years of drought in southwest Texas. Stocking records and range survey data from ranches provide an exceptional record during this critical period on privately operated ranges. Actual stocking rates of pastures were reduced materially in 1946 but have remained relatively constant since, and are still above "proper" rates. Despite reduced livestock numbers, the degree of use of the grass has been heavy to severe on most the range since 1946. Range conditions have declined seriously despite efforts at conservation. Detailed histories of stocking and changes in range condition from 1945 to 1948 are presented for five pastures. Composition of perennial grass stands in ungrazed exclosures has not materially changed during the drought, but annuals have invaded the thinned stands with the first season of adequate moisture. Forage production in 1948, however, was only one-fifth to one-half as much as on comparable areas in 1945 in ungrazed enclosures. Evidence reviewed indicates that ranges in fair conditions, can recover rapidly with favorable grazing conditions and good management, but those in poor condition will improve very slowly without artificial conservation treatments and seeding.

A criterion for adjusting stocking rates in proportion to the rainfall already received is suggested.

RESEEDING THE RANGE BY AIRPLANE.

By John R. Killough; Jour. of Range Mgt., Vol. 3, No. 1, pp. 33-41. January 1950.

The aerial revegetation work done in Wyoming consists of 20,000 acres reseeded with pelletized seed and 24,000 acres reseeded with naked seed. The twelve project areas which have been completed vary greatly in altitude and topography and operations were carried on in all types of weather conditions.

This paper presents the methods and techniques of broadcasting seed by airplane, the cost of this type of reseeding, and other phases prior to actual germination. There are successful examples of aerial revegetation which have encour-

THE FOREST RANGE IN SOUTHERN AGRICULTURE.

By W. O. Shepherd; Jour. of Range Mgt., Vol. 3, No. 1, pp. 42-45. January 1950.

Forest range is now making only a small fraction of its potential contribution to southern agriculture. Its value can be expected to increase, however, with the adoption of improved management practices and the development of the southern livestock industry. Because the problems involved in forest grazing have so many ramifications, they call for coordinated effort in the fields of forestry, range management, animal husbandry, agronomy, and perhaps others such as wildlife management.

NEW METHODS OF BRUSH CONTROL FOR MORE GRASS.

By Harry M. Elwell and Maurice B. Cox; Jour. of Range Mgt., Vol. 3, No. 1, pp. 46-51. January 1950.

The proper use of selective herbicides does not destroy the land cover. Leaves, twigs and stems of black-jack and other oak brush sprayed with a mixture of 2,4-D and 2,4,5-T all accumulated as a mulch on the soil. There was an average of 7,593 pounds per acre of litter two years after the treatment. The mulch conserves water, practically eliminates erosion, and makes conditions favorable for the growth of big bluestem and other grasses. Measurements made during an eight-year period show that 45 per cent less water ran off annually from good grass on cleared land than from an adjacent area of brushland.

These native grasses grew largely from the few spindling plants intermingled in the brush. The yield of grass in 1949 was 2,836 pounds per acre from plots sprayed in 1947. This yield was equal to that of virgin meadows, and about five times more than that on adjacent brushland.

Similar land cleared mechanically has produced an average of 66 pounds of beef per acre during periods of summer grazing the past six years. The lowest seasonal production was 59 pounds of beef and the highest was 80. This production of beef is 1.65 times more than that produced on adjacent regrassed eroded pastures.

RESEEDING RESEARCH IN THE INTERMOUNTAIN REGION.

By George Stewart; Jour. of Range Mgt., Vol. 3,

There are four generalized planting zones (sagebrush, mountain brush, subalpine, and salt-desert shrub) in the Intermountain region in which reseeding research at various levels has so far been done. Research is most advanced in the sagebrush zone. Species suitability is being tested at four sites in Ephraim Canyon, Utah, comparable in elevation to the four zones. Crested wheatgrass does better in the sagebrush zone than any other species of grass. At the higher sites, intermediate and stiffhair wheatgrasses and smooth brome outrank all other species.

Sagebrush can be eradicated most effectively by burning. Mechanical methods vary in effectiveness, with the wheatland plow (one-way disk), the offset disk, and the brushland plow all giving a 75 per cent kill or better. Moldboard and wheatland type plows are highly efficient mechanical means of reducing competition from wheatgrass; early summer burning is also particularly effective. Drilling of seed is generally more successful than broadcasting. In the Valleys and sagebrush foothills, a seeding rate of 6 to 8 pounds of crested wheatgrass to the acre is considered best. Seeding rates for adapted species of 12 to 15 pounds are best in the mountainous zones. The most favorable average time of seeding at the lower elevations has been during October.

The presence of sagebrush on a site indicates that precipitation, temperature, and soils relations are favorable for reseeding and that soil salinity is low. Several superior strains of bromes and wheatgrasses, yielding from 3 to 5 times more herbage than unselected stock, have been developed by controlled pollination. Grazing studies indicate that cattle grazing at the rate of a cow-month to 1 1/2 to 2 acres, gain an average of 2 pounds a day for 60 to 70 days in the spring on range reseeded to crested wheatgrass.

THE MESQUITE PROBLEM IN THE SOUTHWEST.

By C. E. Fisher; Jour. of Range Mgt., Vol. 3, No. 1, pp. 60-70. January 1950.

Invasion of mesquite on range and pasture land in the southwest is of major concern to livestock raisers. Mesquite thrives in the dry climates of Southwestern United States. It is typically a sprouting tree or shrub that has a well-developed root system that enables it to compete effectively for moisture with perennial grasses. It takes on many growth forms due to variations in moisture, soils, low temperatures, fire and mechanical injury.

The abundant production of and apparent longevity of the seed together with the periodic emergence and survival of large numbers of seed-

lings during favorable periods greatly increases the difficulty of obtaining lasting control of mesquite on extensive areas of rangelands.

Effective control is dependent on destroying the dormant sprout buds on underground stems, either by removing the plant below the lowest bud or killing the buds through the use of chemicals or oils and controlling reinfestations by seedlings. Light oils, kerosene, diesel fuel and others have been used successfully to control light stands of single to few-stemmed mesquite growing on porous soils. Sodium arsenate is the most effective and economical chemical found to control mesquite. However, its use is limited by the poison hazards to man and livestock.

CONNECTICUT POSES FOR ITS SOIL PORTRAIT.

By C. L. W. Swanson; What's New in Crops and Soils, Vol. 2, No. 6, pp. 20-22. March 1950.

Soil Scientists are making a complete and modern inventory of the soils in Connecticut. The new survey will be in much more detail than the standard surveys. The survey will provide basic information for tobacco, potatoes and fruit growers, market gardens and general farmers. It will be equally valuable to those managing forested and recreational areas.

SOIL FERTILITY KEY FACTOR IN CONSERVATION.

By Emil Truog; What's New in Crops and Soils, Vol. 2, No. 5, pp. 7-11. February 1950.

Soil fertility is a major factor in conservation. A high state of fertility advances the conservation program by (1) producing heavier plant growth which protects the soil from raindrop splash, washing by surface flow and wind blowing; (2) vegetal cover increases amount of intake of water by extracting more water from the reservoir of the soil and by increasing the rate of infiltration; (3) by increasing crop yields on the more level fields, thus reducing the need for growing row crops on sloping fields; and (4) by making it possible to grow needed quantities of the common agricultural crops on fewer acres, thus releasing more land for permanent vegetal covers.

FROM BRUSHLAND TO BEEF FACTORY.

By Harley A. Daniel; What's New in Crops and Soils, Vol. 2, No. 5, pp. 12-14. February 1950.

The author explains how millions of acres of brushland in the southwest can be converted to pasture use and thus to profitable beef production. This can be accomplished by removing the

brush either by spraying them with certain chemicals, or removing them by mechanical means or by a combination of the two.

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FEED IT TO DEATH!

By Wilbert Schall; What's New in Crops and Soils, Vol. 2, No. 5, p. 15. February 1950.

Broomsedge, the curse of thin, unproductive pasture soils can be easily whipped by raising the level of fertility of the soil by the addition of appropriate fertilizer materials in adequate amounts.

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RESEEDING LEGUMES REPLENISH THE SOIL.

By W. E. Adams; What's New in Crops and Soils, Vol. 2, No. 5, pp. 16-18. February 1950.

Southern farmers should depend upon reseeding annual and biennial legume plants to protect the soil. Well established cover crops of this type have the ability to decrease runoff and soil losses, reduce leaching, and improve the soil. The work being done by the author along this line is discussed.

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MOUNTAIN MEADOWS RESPOND TO PROPER MANAGEMENT.

By D. W. Pittman and R. F. Nielson; Utah Agr. Exp. Sta., Farm and Home Science, Vol. 11, No. 1, pp. 10, 11, 21 and 22. March 1950.

Experiments in typical mountain meadow areas throughout the state show that forage production can be increased in these meadows by plowing and reseeding to high producing palatable grasses and clovers, by maintaining high fertility through the use of fertilizers, and by controlling irrigation water to prevent excessive flooding.

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CONTROLLED BURNING AS A DUAL-PURPOSE TOOL OF FOREST MANAGEMENT IN NEW JERSEY'S PINE REGION.

By S. Little, J. P. Allen and E. B. Moore; Jour. of Forestry, Vol. 46, No. 11, pp. 810-819. November 1948.

Subject to frequent and devastating fires the New Jersey pine region is one of the "hot spots" of the northeast. Scrub forest with tall resinous-leaved shrubs and heavy accumulations of duff present dangerous fuel conditions. Long fire seasons, few obstructions to wind and soils that dry readily add to the hazard. Disasterous fires as a consequence are all too common. Furthermore, favored by protection, oaks and other

low-value hardwoods have encroached on pine land where they seldom obtain sawlog size. Controlled burning properly applied and safeguarded offers an effective tool both for reducing fuel and favoring pine over oak.

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METHOD OF CORRELATING SOILS WITH DOUGLAS-FIR SITE QUALITY.

By W. W. Hill, Albert Arnst and R. M. Bend; Jour. of Forestry, Vol. 46, No. 11, pp. 835-841. November 1948.

Determination of timber site quality on denuded areas is a desideration for foresters and for land owners and managers. This article reports a method of correlating soil characteristics with site quality of Douglas-fir in Lewis County, Washington. The method makes possible the prediction of growth rates, within narrow limits, for this species in this area. The method may be applicable, with slight modifications, to other areas and species.

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WATERSHED CONDITION AND FLOOD CONTROL.

By Howard W. Lull; Jour. of Forestry, Vol. 47, No. 1, pp. 45-48. January 1949.

A method of computing the expected runoff from a flood-producing storm on the Ephraim Creek Watershed is described in detail. Control measures needed to prevent such floods are suggested.

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VARIABILITY OF ROOTING IN A SMALL SECOND-GENERATION POPULATION OF THE HYBRID PINUS ATTENU-RADIATA.

By J. W. Duffield and A. R. Liddicoet; Jour. of Forestry, Vol. 47, No. 2, pp. 107-109. February 1949.

Propagation of conifers by rooting of cuttings is an old art that has recently benefited by the findings of the plant physiologist. The forest tree breeder may now use rooting as a tool in his efforts to evaluate the heredity of his trees. In a study undertaken to use vegetative propagation of members of a variable hybrid population as a guide for selecting superior individuals, the authors found that wide differences occurred in rooting ability among members of the population, and that in general the differences corresponded in two successive years.

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CHEMICAL BRUSH CONTROL IN FOREST MANAGEMENT.

By Paul Zehngraft and John von Bargen; Jour. of

Forestry, Vol. 47, No. 2, pp. 110-112. February 1949.

Several million acres of potentially valuable pine land are occupied by brush in the northern Lake States. Removal of brush by cutting is too expensive to be practiced. Trials of chemical herbicides in northern Minnesota have given promising results in control of hazel brush. Results of these tests on the Chippewa National Forest are reported here.

USE OF THE HELICOPTER FOR SOWING MUSTARD SEED IN BURNED AREAS OF SOUTHERN CALIFORNIA.

By Clark H. Gleason and Donald G. MacBean; Jour. of Forestry, Vol. 47, No. 3, pp. 192-195. March 1949.

The helicopter demonstrates its versatility in still another forestry job, sowing mustard seed on the Angeles National Forest.

WEED CONTROL IN GUAYULE SEEDBEDS WITH STOVE OIL.

By Edward D. Clifford; Jour. of Forestry, Vol. 47, No. 4, pp. 271-276. April 1949.

Wartime shortage of labor led to extensive experiments to determine the efficiency of oil sprays in controlling weeds in Guayule nursery beds. Many of the principles worked out in these tests probably can be applied to control weeds in the various types of forest nurseries.

INFLUENCE OF SOME WATERSHED VARIABLES ON A MAJOR FLOOD.

By H. W. Anderson and H. K. Trobitz; Jour. of Forestry; Vol. 47, No. 5, pp. 347-358. May 1949.

Peak discharge and sediment deposition from watersheds during a major flood were found to be quantitatively related to forest cover density and other watershed characteristics. Forest fires as a principal cause of cover differences had an important effect in increasing peak discharges and erosion during a major flood. The independent effects of some watershed variables on peak discharges and sediment deposition were isolated in quantitative terms by means of multiple regression analysis.

POISONING SOUTHERN UPLAND WEED TREES.

By Fred A. Peevy and Robert S. Campbell; Jour. of Forestry, Vol. 47, No. 6, pp. 443-447. June 1949.

The "ammate method" of poisoning weed trees has found increasing application on forests and ranges in the south and elsewhere during the past 2 years. This article describes improvements in the method, and briefly reports experiments comparing ammate with sodium arseate and 2,4-D.

EROSION CONTROL ON PALOMAR MT. OBSERVATORY ROAD.

By Gustaf Juhrem; Jour. of Forestry, Vol. 47, No. 6, pp. 463-466. June 1949.

The road to the Palomar Mt. observatory presented unusual tasks in conservation and a vexing problem of erosion control. After much damage to the road from soil losses, this problem was solved by the use of vegetation on all road fills.

RESULTS OF THINNING EXPERIMENT IN PONDEROSA PINE POLE STANDS IN CENTRAL ARIZONA.

By Herman Krauch; Jour. of Forestry, Vol. 47, No. 6, pp. 466-469. June 1949.

Results of a twenty-year study in Ponderosa pine suggest that thinning may shorten the timber rotation by as much as thirty years.

THE NEW BRADLEY TRANSPLANTER.

By A. D. Slavin and Stanley S. Locke; Jour. of Forestry, Vol. 47, No. 7, pp. 531-532. July 1949.

The authors present notes on the background of the development of an adaptability to forest tree nurseries of the Bradley Transplanter.

THINNING EVEN-AGED LOBLOLLY AND SLASH PINE STANDS TO SPECIFIED DENSITIES.

By R. Stahelin; Jour. of Forestry, Vol. 47, No. 7, pp. 538-540. July 1949.

Thinning studies require a reliable measure of the densities achieved by the thinning treatments selected. The relationship between average d.b.h. and normal basal area per acre has been used to provide such a measure for experiments at Auburn, Alabama.

THE GERMINATION AND INITIAL ESTABLISHMENT OF LOBLOLLY PINE UNDER VARIOUS SURFACE SOIL CONDITIONS.

By Kenneth B. Pomeroy; Jour. of Forestry, Vol. 47, No. 7, pp. 451-453. July 1949.

Experiments are reported covering the influence of soil texture and surface litter on germination and seedling survival.

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IS LITTER A BARRIER TO THE INITIAL ESTABLISHMENT OF SHORT-LEAF AND LOBLOLLY PINE REPRODUCTION?

By Charles X. Grano; Jour. of Forestry, Vol. 47, No. 7, pp. 544-548. July 1949.

With a bumper shortleaf-loblolly pine seed crop of 1947, litter on the Crossett Experimental Forest did not prevent initial establishment of adequate numbers of pine seedlings in stands in which there had been no special seedbed preparation.

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AN ANALYSIS OF FORAGE UTILIZATION METHODS AND A PROPOSAL FOR UTILIZATION SURVEYS BY RANGE CONDITION CLASSES.

By R. R. Humphrey; Jour. of Forestry, Vol. 47, No. 7, pp. 549-554. July 1949.

The "range condition method" of making forage utilization surveys is presented and described. The method has been tested for each of the past four years on about 38,600 acres of rangeland in Central Washington. It has proved rapid, easy to learn and apply, and has provided practical information that has been used by the ranches in modifying their management practices. The method is not new in the sense of providing wholly new principles or techniques. It adopts and enlarges upon ideas included in other methods, notably the general reconnaissance method and the light-weight method. It goes farther than these, however, in adding some new ideas and in combining the whole into a single, easily applied field technique.

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RESULTS OF AIRPLANE PELLET SEEDING ON INDIAN RESERVATIONS.

By Joe A. Wagner; Jour. of Forestry, Vol. 47, No. 8, pp. 532-635. August 1949.

This paper discusses the method and results of airplane pellet seeding on range lands in Arizona and New Mexico.

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INFLUENCE OF SPACING ON GROWTH OF RED PINE IN PLANTATIONS.

By W. C. Bramble, H. N. Cape and H. H. Chisman; Jour. of Forestry, Vol. 47, No. 9, pp. 726-732. September 1949.

The spacing at which trees are planted appears to be one of the more important factors influencing their early growth rate and development. Although the general nature of the effects of various spacings is fairly well understood, the magnitude of those effects is not. For example, although too wide spacing is commonly conceded to lead to an excessively tapered bole, large bunches, and slow natural pruning, it is not known just how far one may go towards providing maximum growing space and still get acceptable form and quality of product in many of our commonly planted species.

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THE ECOLOGICAL BASIS FOR JUDGING CONDITION AND TREND ON MOUNTAIN RANGE LAND.

By Lincoln Ellison; Jour. of Forestry, Vol. 47, No. 10, pp. 787-795. October 1949.

Accurate judgement of range condition and trend on mountain range land of the west is no cut-and-dried matter. This fact is high lighted by a tendency toward increasing conservation in grazing-capacity estimates over the years, recently by many sharp disagreements between livestock operators and officials responsible for management of public lands, and, in some instances, by wide differences of opinion among range managers themselves. A better understanding of the ecology of mountain range land is needed to help reduce these differences. This paper attempts to fill this need to the extent of explaining the ecological basis of the concepts condition and trend.

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EROSION FROM MELTING SNOW ON FROZEN GROUND.

By M. H. Tigerman and J. M. Rosa; Jour. of Forestry, Vol. 47, No. 10, pp. 807-809. October 1949.

Erosion caused by snow melting on frozen ground on western mountain slopes has been given little attention. The authors present some observations to show that it is of considerable importance.

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USE OF "AMMATE" FOR POISONING PONDEROSA PINE IN STAND IMPROVEMENT.

By Francis R. Herman; Jour. of Forestry, Vol. 47, No. 12, pp. 966-967. December 1949.

Ninety limby ponderosa pine poles, 30 to 35 years old and 4 to 8 inches in diameter, were used in the test. The trees were divided into three groups of 30 each. Two sets were treated with ammate to serve as a check. Ten trees of each set were poisoned in July and again in October

to provide a measure of seasonable variations. The results are discussed.

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THE FORMATION AND CONTROL OF ARROYOS IN THE SOUTHWEST.

By James W. Deppa; Jour. of Forestry, Vol. 46, No. 3, pp. 174-179. March 1948.

The great arroyos of the southwest form an important part of regional problems of watershed restoration. The author discusses the principles of arroyo formation and describes tested and practical methods for their control.

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TESTS ON THE ADAPTABILITY OF TREES AND SHRUBS TO SHELTERBELT PLANTING ON CERTAIN PHYMATOTRICHUM ROOT ROT INFESTED SOILS OF OKLAHOMA AND TEXAS.

By Ernest Wright and H. R. Wells; Jour. of Forestry, Vol. 46, No. 4, pp. 256-262. April 1948.

One limitation on the establishment of shelterbelts in some sections of Oklahoma and Texas, is the natural occurrence of phymatotrichum root rot in the soil, rendering such sites unsuitable for standard plantations. Tests have shown that none of the tree or shrub species used was immune to infection but a few proved to be highly resistant. A five-row shelterbelt of resistant species is suggested which should provide satisfactory protection for many years.

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GROWTH OF SOUTHERN PINE PLANTATIONS AT VARIOUS SPACINGS.

By L. M. Ware and R. Stahelin; Jour. of Forestry, Vol. 46, No. 4, pp. 267-274. April 1948.

Before engaging in the long-term enterprise of tree-planting, landowners rightly want clear-cut advice on what species to plant, what spacings to use, and how to treat the growing plantation to obtain the greatest revenue. This article reports contributions to this knowledge from 41-year-old plantations of southern pines at Auburn, Alabama.

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FORESTRY IN SOIL CONSERVATION.

By John W. Keller; Jour. of Forestry; Vol. 46, No. 5, pp. 340-343. May 1948.

Forest vegetation is the most effective means of preventing soil erosion. Forest practice consequently is one of the important tools used by

the Soil Conservation Service in its vital task of protecting soil on American farms. The writer describes the activities of the organization and indicates how forestry is integrated with other soil-saving practices to the end that soil may be saved, farm production increased, and farm life made permanently more secure.

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INFILTRATION AND RETENTION TESTS AS RELATED TO SPILLWAY DESIGN FLOODS.

By Paul Leatham and H. S. Reisbol; Amer. Geo. Union Trans., Vol. 31, No. 2, Part 1, pp. 234-241. April 1950.

This paper presents a correlation between infiltration rates indicated by field infiltrometer tests, and retention as indicated by studies of the difference between storm rainfall and stream flow for the same area. A measure of the least probable retention which will occur concurrently with a maximum possible rainstorm has been an uncertain factor in the derivation of the maximum probable flood for use in determining reservoir and spillway capacities. The paper presents results of a series of infiltrometer test runs on plots of ground selected as representative of the various soil - land use complexes to be found under maximum flood hazard conditions in the Kansas River Basin. A comparison is developed between the results of these infiltrometer tests, applied to several storm areas, and the relationship between the retention determined in an analysis of these several storms and the resultant flood runoff. The apparent correlation obtained indicates that infiltration and retention tests can be used successfully to supplement other methods of determining design retention rates and to facilitate the extension and transposition of accepted minimum retention rates to adjacent or comparable drainage areas.

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A METHOD OF EVALUATING THE HYDROLOGIC EFFECTS OF LAND USE ON LARGE WATERSHEDS.

By Donald E. Whelan; Amer. Geo. Union Trans., Vol. 31, No. 2, Part 1, pp. 253-261. April 1950.

The author presents a method for subdividing the total flood hydrograph into separate hydrographs for surface, subsurface, and ground-water runoff. A unit hydrograph is derived by considering surface and subsurface runoff contributing simultaneously by unit time periods. The total flood hydrograph as modified by a land-use program is computed by using the above derived unit hydrograph, ground-water relations, and changes in land use.

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